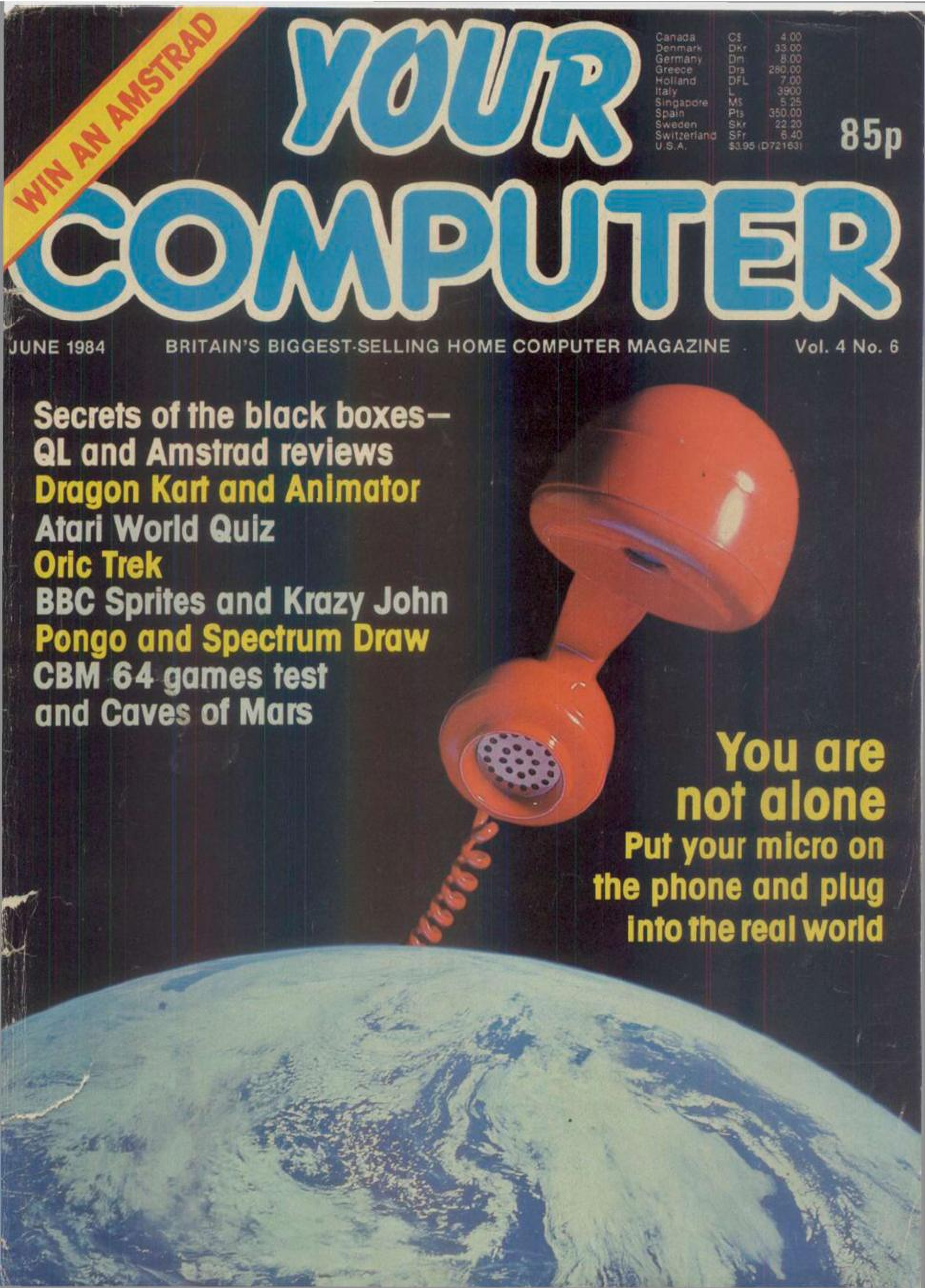


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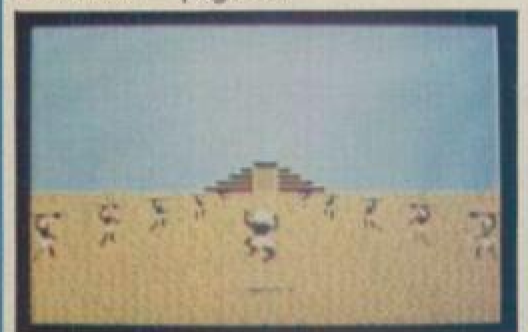
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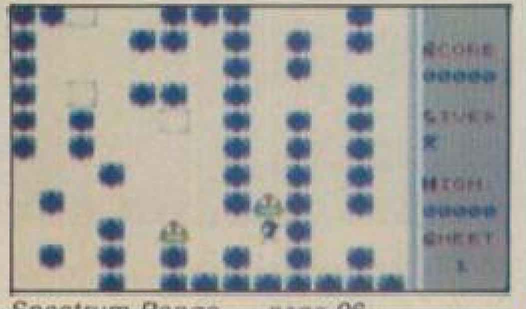
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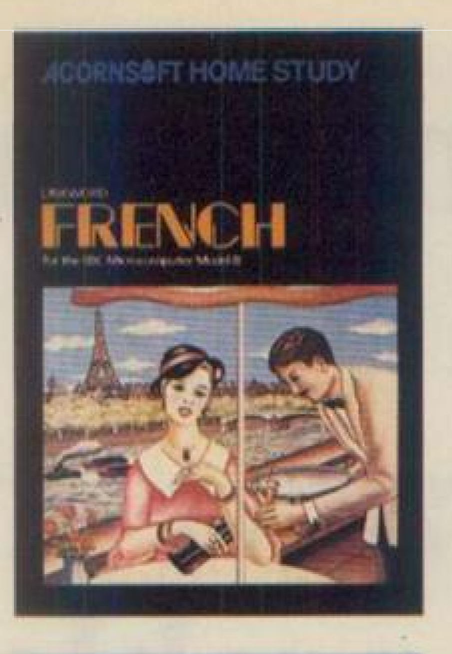
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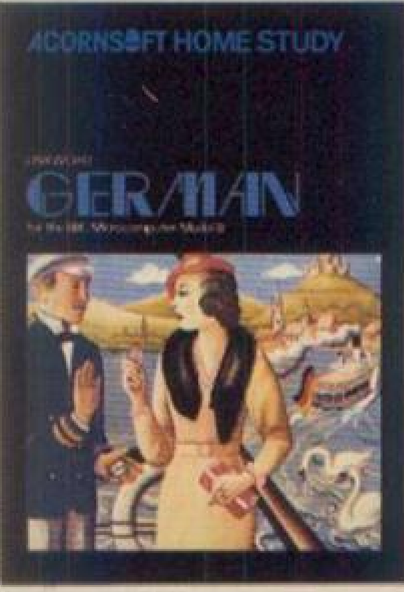
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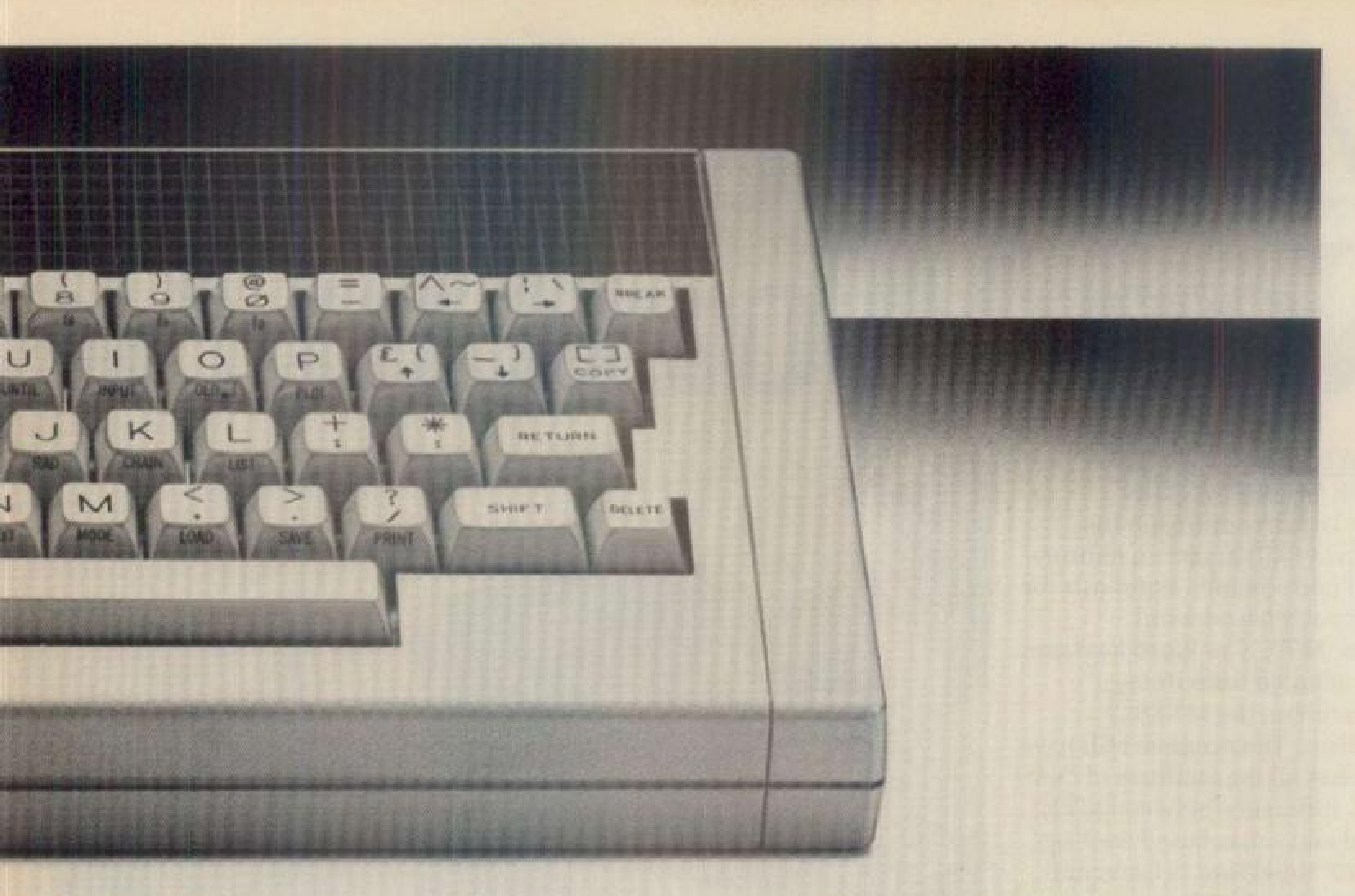
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COMMANDS AND FUNCTIONS

^A	cursor word left
^B	align paragraph
^C	scroll down screen
^D	cursor right
^E	cursor up
^F	cursor word right
^G	erase to the right
^H	erase to the left
^I	cursor to tab
^J	help
^KD	save file
^KQ	abandon changes
^KS	save and resume
^L	find/replace again
^M	carriage return
^O	on-screen menu
^OC	centre a line
^OD	print control display
^OI	set tab stop
^OJ	justify on/off
^OL	set left margin
^ON	clear tab stop
^OR	set right margin
^OS	set line spacing
^OX	margin release
^P	print controls menu
^PB	bold print on/off
^PC	pause in document
^PS	underlining on/off
^Q	quick menu
^QA	find and replace
^QC	go to document end
^QF	find
^QR	go to document start
^QY	delete to end of line
^R	scroll up a screen
^S	cursor left
^T	delete a word
^U	escape
^X	line down
^Y	delete entire line

DOT COMMANDS

.MB	set bottom margin
.MT	set top margin
.OP	omit default page nos.
.PA	page break
.PC	set page number col.
.PL	set page length
.PN	set page number
.PO	set page offset
..	comment line

OPENING MENU

X	Exit
J	Help
D	Load a document
C	Create a document

OTHER MENUS

^O	Onscreen Format
^Q	Quick menu
^K	Save & printing
^P	Print controls
^J	Help pages

K software, from wton to Nemo.....



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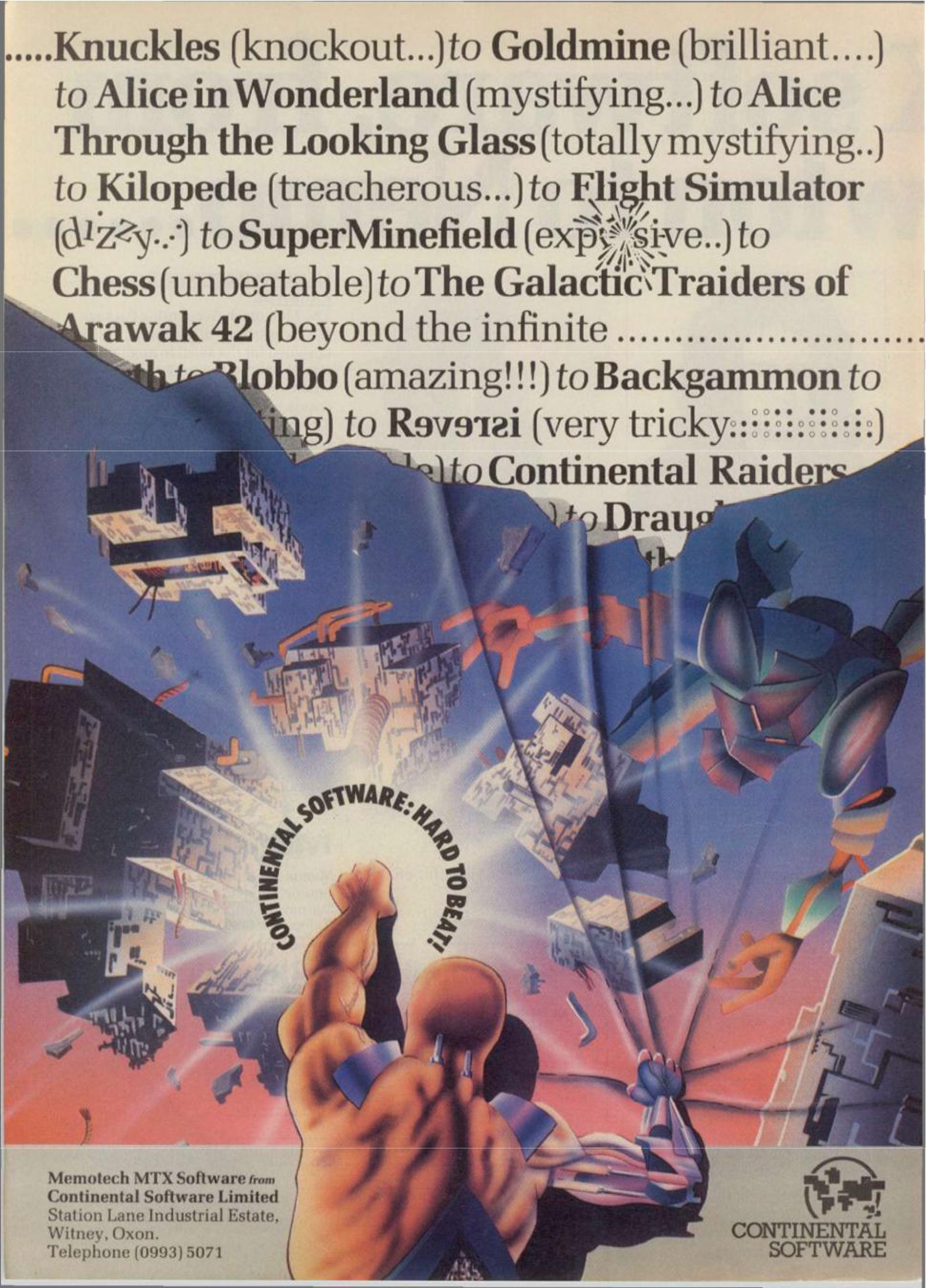
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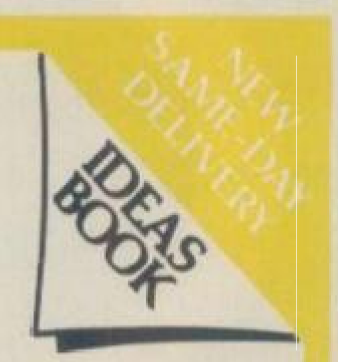
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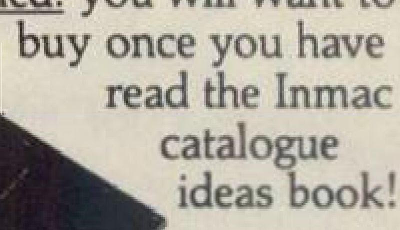
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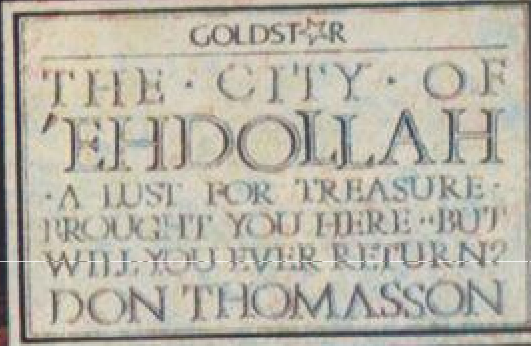
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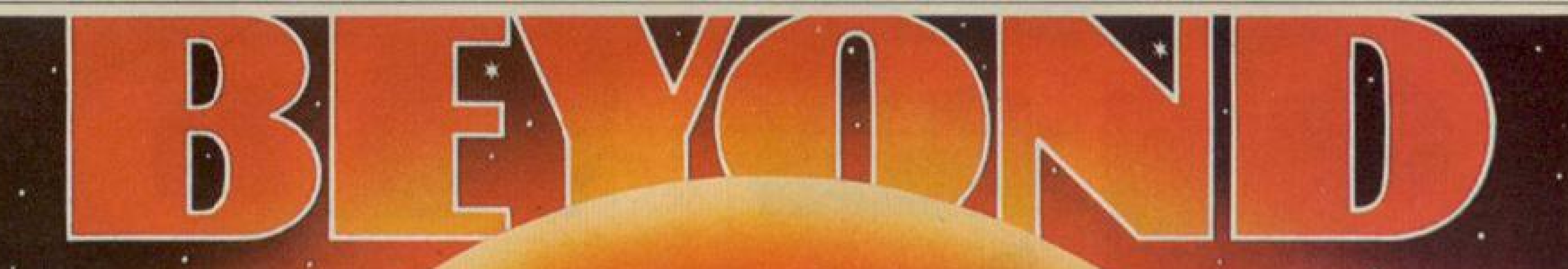
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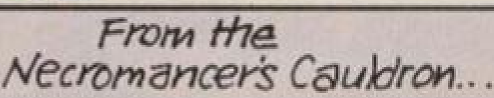


NEW

PSYTRON

Matter Disruptor complex report terminated: Estimate 75 personnel unaccounted for: Repair and medi-crews alerted: Defence circuits detect responsible alien craft now locked onto new target. Saboteur sighted in central corridor Sector 7: Pursuit Droid activated: Switching to visual:::

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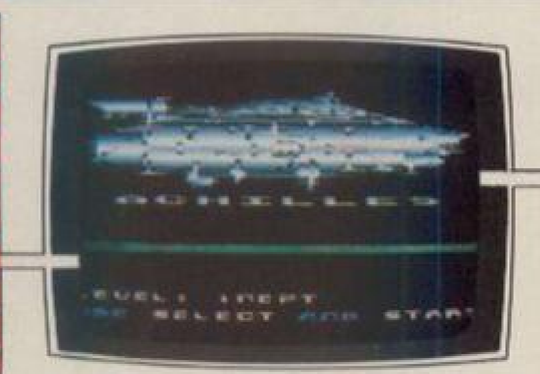
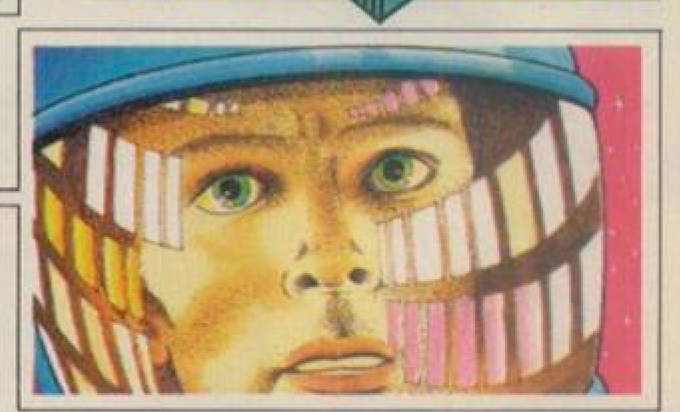
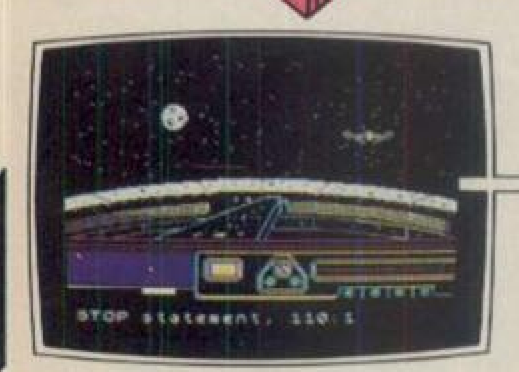













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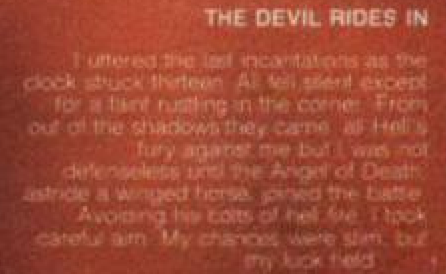
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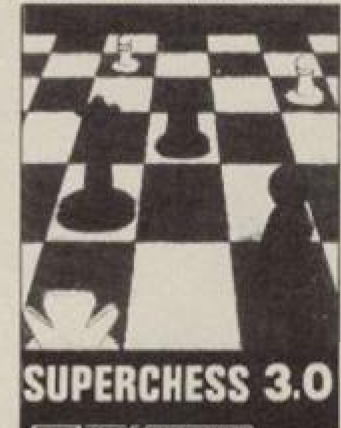
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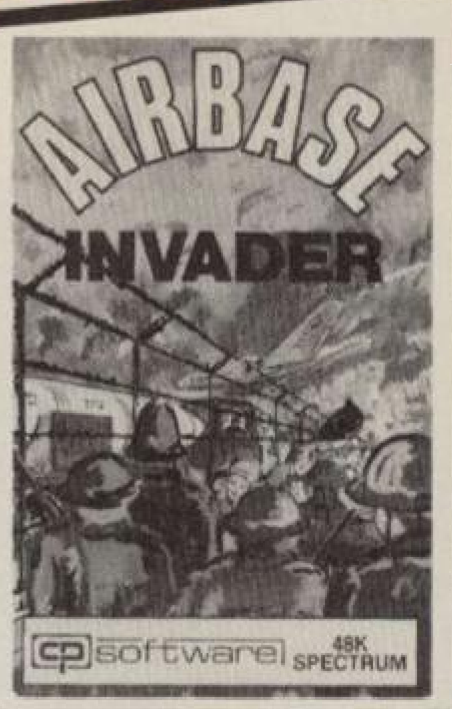
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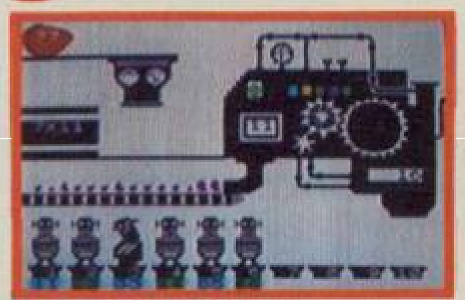
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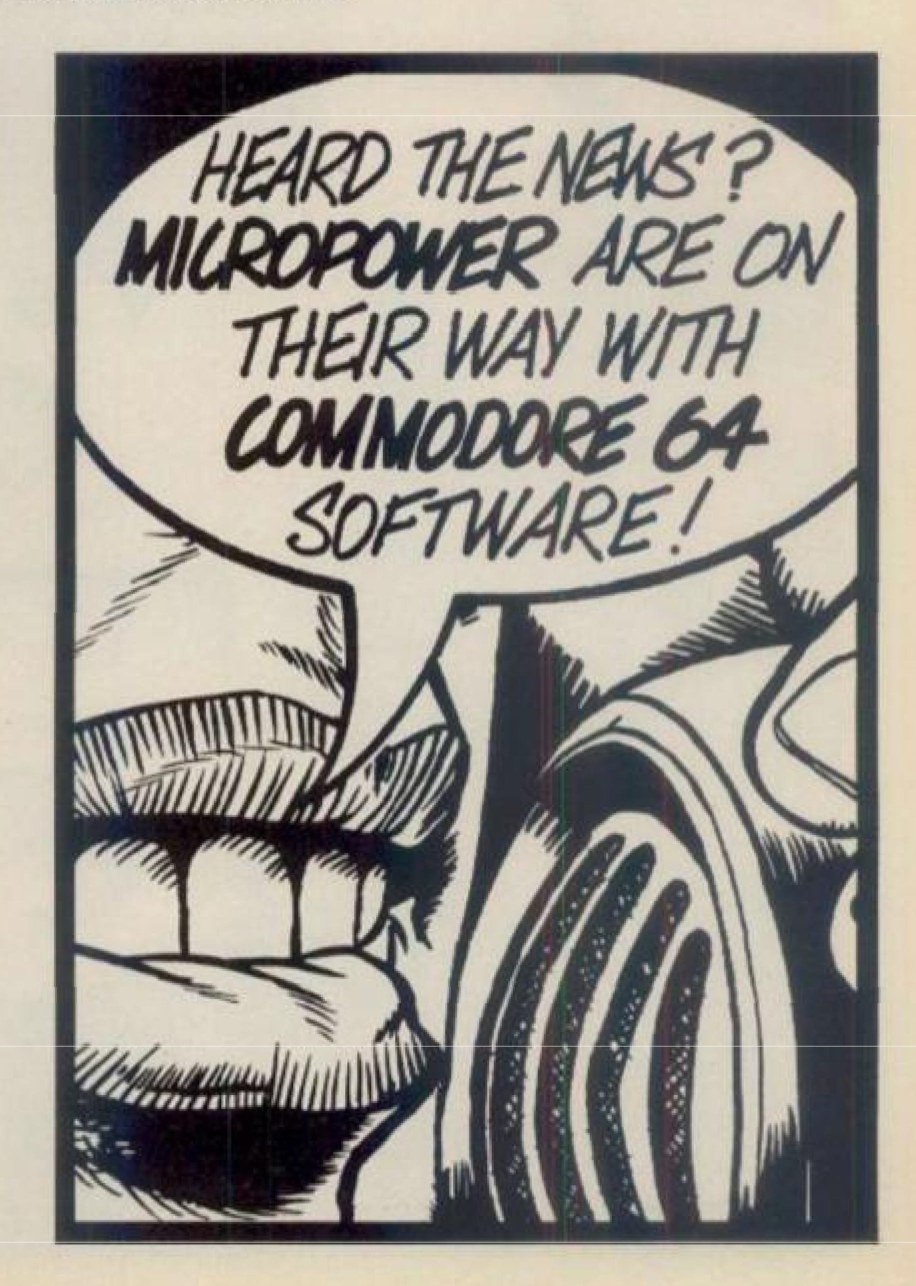
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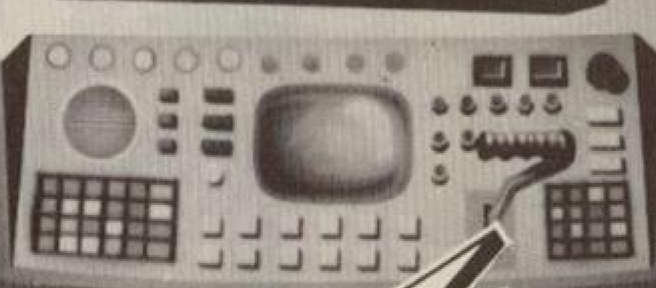





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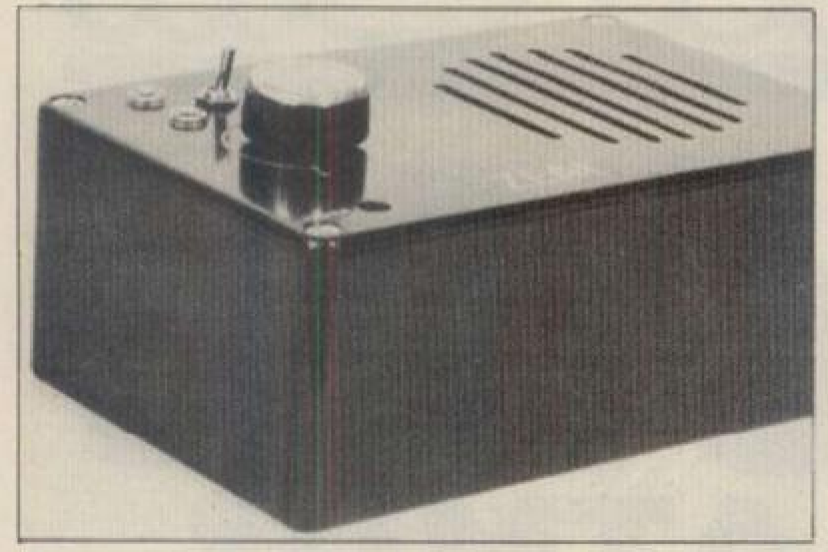
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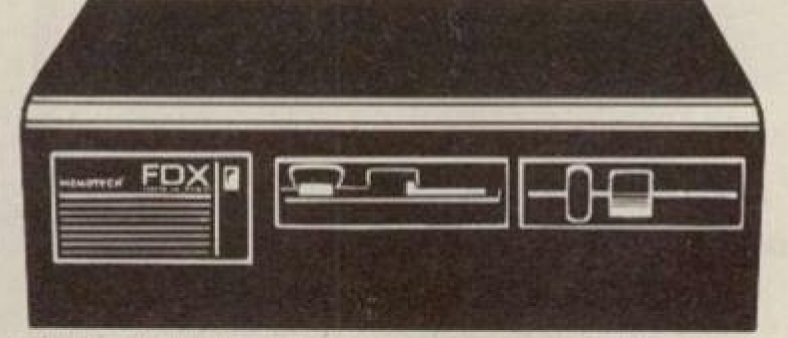


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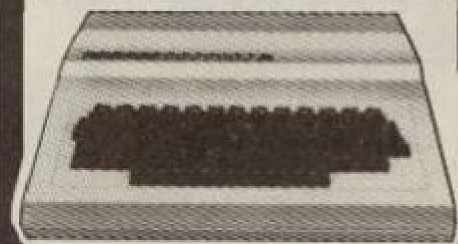
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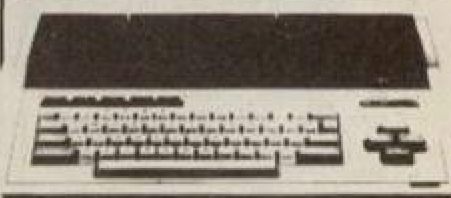


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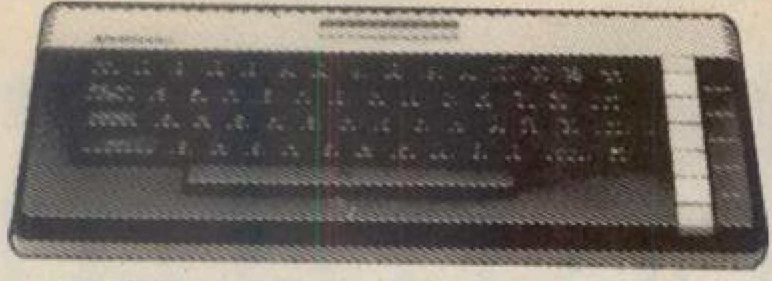
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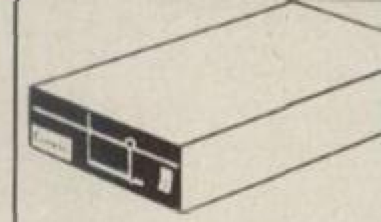
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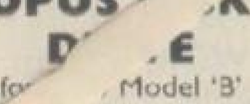
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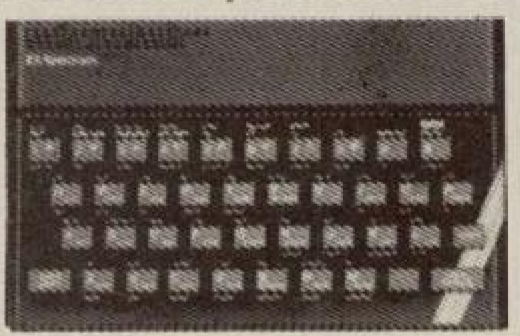
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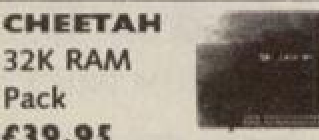
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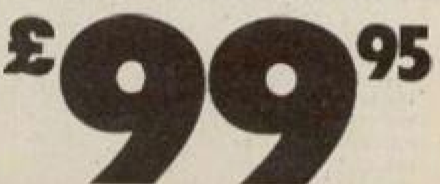


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A SATISFIED QL CUSTOMER

In defence of Sinclair following the public outcry resulting from the late delivery of the QL, I am pleased to say that my computer arrived in the month of April as promised by Sinclair — delivered by private car.

I had attempted during the week ending April 28 to obtain a delivery date from Sinclair and was advised that no depatch dates on the QL were available on their inquiry computer. I was somewhat incredulous to hear the young lady say that delivery would still be met — yet another broken promise I thought.

On Monday, April 30 — the last day for Sinclair to meet their self-imposed dead line — no QL in the mail. During the day I was pleasantly surprised to be advised by my wife that the computer had been delivered to my Crawley address by car.



I placed an order with Acorn for a BBC A Micro at £235 prior to the price increase and suffered excuses and non-delivery for a year — until I gave up on Acorn. Even a letter to the Director General of the BBC duly answered by the BBC failed to evoke response from Acorn.

I was pleased that someone in the home micro business could keep a promise. The QL arrived complete with the add-on Eprom cartridge plus the free RS-232C lead and a blank Microdrive cartridge additional to the four promised. The manual was incomplete as no SuperBasic reference information was available. A note with the computer advised of despatch by post in the new few days.

The extra blank Microdrive cartridges are essential as you are requested in the manual to make back-up copies of the Psion software, the only blank cartridges to be supplied would thus leave no blanks for your own use.

The bundled software from Psion was quite impressive for its completeness — no home/small business micro user is likely to require more powerful software.

I await the remainder of the manual with interest to explore the facilities available — yes there are windows and they do seem to work. Thank you Sinclair for keeping your promise.

Ian B. Michie, Crawley, Sussex.

THE QL SAGA

Those who ordered a Spectrum in the first couple of days of its release received the computer within seven weeks. Any delay in ordering and the prospective customer joined the queue for a 16-week wait. The machine, except for a slight timing fault, was ready at the launch and Sinclair could reasonably point to the massive demand as an excuse for the delays.

Early 1983 the computing press in general gave Oric a very bad time for announcing a machine that was not ready. Those who placed early orders waited 14 weeks to receive a machine which was obviously sub-standard with terrible display problems. Even greater delays were found by those who ordered a while after the launch.

One year on, here we go again. Sinclair has sent letters to some of those people who ordered a QL before the official launch date of January 20 giving a delivery date of before the end of April — 16 weeks. It was still late. Complaints by the public were upheld by the advertising standards authority over deliveries of the ZX-81 and Spectrum. This latest fiasco indicates how ineffectual writing to the authority becomes. I actually received a card post marked January 25 informing me that the QL was being processed for despatch.

On February 15 I received a letter dated February 9 informing me of the "expected" delivery date of before the end of April. This arrived virtually to the day on the 28-day original order delivery date.

Darren Robert, Woking, Surrey.

PAC-81 CHANGE

I want to thank you and Philip Harwood for that very good Pac-81 game. But while my children are used to the W-D-X-A keys to move up-right-down-left, I have made the following changes. Maybe they are of use for other readers.

```
POKE 16907,84
POKE 16914,76
POKE 16918,3
POKE 16921,92
POKE 16925,69
POKE 16929,2
POKE 16932,77
```

They also like to start playing with high score set to zero. This can be done by Poking 156 in the addresses 16865 to 16869.

I hope you will continue to publish machine code games for the ZX-81, because I find that's the computer most people started with.

G. Mannaerts, Kluislaan 9, B-2070 Ekeren (Antw).

NO TO BUTTER

With reference to *Your Computer*, March Kathleen Peel has dropped an awful clanger in her article on cleaning the Sinclair printer. NEVER USE BUTTER as a lubricant.

It contains (or is likely to contain) salt and water — guaranteed to cause corrosion on anything but highly alloyed stainless steel. Use Vaseline Instead.

I write this as an urgent message to prevent thousands of printers being irreparably damaged.

Don F. Gordon, Sheffield.

DON'T USE VDUs

The article accompanying the Squares game for the BBC Micro, in the April edition of *Your Computer*, gives an erroneous impression regarding the use of VDU statements to speed up program execution. In the article, Keith Miles suggests that replacing commands such as Move and GCol by VDU25,4 and VDU18 will give faster programs.

Unfortunately, this is a commonly held misconception. Using these VDU statements will, in fact, make BBC Basic programs run slightly slower. As a general rule, it is usually best to use special commands such as Move or Draw, where provided, in preference to the equivalent VDU statements. If readers wish to speed up the Squares program, I would suggest they try replacing the long variable and procedure names with much shorter ones, using upper case characters instead of lower case. While this leads to some loss of readibility, these techniques have a more favourable effect on execution speed than the mistaken suggestions regarding VDU statement substitution.

Lawson B. Wakefield, South Wirral.

GETTING IN

As you will probably know, the sequel to Manic Miner is out. Jet Set Willy is a superb program in two ways; first it is a great game and second it has one of the best protections I have ever seen. If you don't know what it is, everybody who buys the program gets a card which has 180 locations on it. At each of these locations there is a four-digit colour code. Whenever the user loads up the program, it will ask him to enter the code at any one of the locations.

The program only gives the user one go at entering the code. If he gets it wrong then the computer will ask for another location. If he gets this wrong the computer resets! In other words you must have the card to run the program. The card cannot be photocopied because the colours used in the code would not show up. Because replacement cards are not given out it would be disastrous if someone lost their card.

I have, however, found out a way of getting round this problem. Before you load the program type in

YC FINDS READER A JOB

I was interested to read your editorial — and would like to make a couple of observations. The first relates to your Design a Micro contest. We took up the opportunity to hire one of your entrants whose "product" and CV appeared in your last issue — it's very much part of our overall strategy of listening to what the active user wants.

The second is to observe that from your editorial assessment list of likes and dislikes about the computing scene at present — our machine is already the one most closely associated with your ideal — yet it is demonstrably the lowest cost product.

The third is to mention that your comment that Amstrad has no experience of making computers is perhaps counterbalanced by the simple observation that those presently in this market could use a few lessons in mass-producing a product for the consumer marketplace themselves — although I readily confess that half the fun of the computer press seems tied into the latest instalments in the "will they — won't they" sagas.

The separate establishment of Amsoft is playing a very important role in bridging the gap in Amstrad's knowledge of this marketplace by being staffed by the "usual" mix of people who are steeped in the business, bright lads and an eager following of independent authors plus an in-house publications team who are designing and producing a range of supporting literature that will be as much a feature of the overall project as the tower system of computing itself. We would not want you to think that Amstrad have not been thorough in their overall approach to a market which they see as featuring heavily in the future of any right minded consumer electronics marketplace.

William Poel, General Manager, Amsoft, Essex.

25 POKE 23672,0:POKE 23673,0:
POKE 23674,0

then instead of loading the first program use the Merge command — this stops the autorun. After the first program is loaded, stop the tape, type Run and start the tape again. The program will load and run normally.

Finally, I also found a way of getting more lives. This is done by typing in:

35 POKE 34785, (the number of lives you require)

at the same time that you would type in line 25.

Mark Sanderson,
Taunton,
Somerset.

HEX ERROR

I would be grateful if you could point out an error which crept in during your re-writing of the hex-loader accompanying my 'Tapesys' article in your magazine, as I have already received two enquiries regarding this:

Line 30 should read:

30 DEF FN h(h$)=CODE h$ – 48 – 7*(h$(1)7"9")

as otherwise, bytes beginning with 9 — e.g., 50056 — are not properly converted. The hex listing itself is fine, so no problems will have been encountered by those using their own hexloaders.

The editing out of the assembler language listing has also caused some confusion. See the following two addresses:

MSGP = 51557
PAUSD = 51638

Paul Rhodes,
Luton,
Bedfordshire.

BETTA BASIC

A few mistakes crept into the ZX-81 program Betta Basic in the April issue of *Your Computer* and I would be most grateful if you could publish the following corrections

First my name Jason and not John as the article says. A line of spaces has disappeared from the top listing on page 131. Line 10 should read:

LET R$ = "(34 spaces)"

Under c) of the PRT command on page 126, a semi-colon has been omitted. There should be two of them after Print statement and not just one as shown. Lastly, error "T" means "missing comma", i.e., one or more arguments have been left out when a routine expects one.

Jason Judge,
Cheltenham,
Gloucestershire.

CORRECTIONS

An error crept into the hexloader program, Listing 1, for the Quickload feature in the May issue. Line 90 should read: LET z=FN h(a$(1))*16+FN h(a$(2)).

The ZX-81 Speech article in May neglected to mention that the machine code needs to be stored in a Rem statement. At the front of Listing 1 insert a Rem statement containing 400 characters as Line 1.

EDITORIAL

WHAT WAS IT THAT made some of the U.K.'s biggest shops and software houses meet in secret with a group of foreign electronics manufacturers? If you happened to know that that manufacturers in question were Japanese, the answer to this riddle becomes a little clearer. Whatever went on at that meeting in April persuaded 20 of our largest software makers to produce MSX programs.

Three months ago MSX, the software and hardware specification adopted by most of the Japanese manufacturers, looked to be no more than an interesting exercise in standardisation. Now the well developed U.K. market has been singled out as the first stop in an itinerary of world domination. Soon MSX giants such as Sony, Yamaha, JVC and Hitachi will threaten the future of the British companies Acorn, Dragon, Oric and Sinclair.

Even computer firms outside Japan are coming round to the idea that software compatibility is important. Proud independents like Commodore are being forced to go for standardisation — the latest Commodore business machines are IBM compatible. Acorn's Z-20 version second processor turns the BBC Micro into a CP/M machine.

Companies like Binatone, cautious after its ill-fated 1982 computer project, have been looking very carefully in recent months at going for the safety of MSX. The bigger rewards of going their own way will always be matched by bigger risks.

With the Japanese flair for manufacture, marketing and distribution behind MSX it may look unstoppable. But there are strong arguments against it: standards by their very nature go for proven technology — and MSX is no exception.

If MSX's Z-80 based hardware specification appears a little staid today, what will it look like in 1986. Even by 1985 Sinclair will have sorted out the QL's teething problems. Furthermore, could the MSX choice of well established technology actually put a brake on software development.

The pro-MSX lobby says that this is missing the point. MSX machines will not necessarily be bought by Spectrum owners who have been educated to expect always a technological step up when they buy a new micro.

MSX will find its market with those who have held back for fear of buying a lemon computer. Quantum leaps forward in innovation are unpopular when equated with quantum leaps back in reliability. Also for new buyers the guarantee of software support may be more important than the machine itself.

As for the point about software development, programs have a lot of catching up to do before they find existing hardware a hindrance. Imagination has always been the limiting factor.

What is certain is that with MSX computers being internally identical, the cosmetics of computer design will become even more vital. No longer will Sinclair be able to say you can have one of his computers in any colour as long as it is black. MSX micros will also be marketed on their expandibility, so the add-ons market will receive a new uplift.

Even though the British manufacturers know what they are up against, they have little time to prepare for the battle which will start this autumn. If they fare well in the first wave of the attack they will find little reassurance in the description of MSX as being no more than the prototype for MSX 2.

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Why not give it a try? You have nothing to lose but your postage.

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"Waiter — there's a mouse on my Apple" "Sir — keep quiet they'll all be wanting one"

MICE ARE MOVING IN. Apple's long overdue price cut and the introduction of Mouse IIe means that you can buy a disc-based Apple IIe with a mouse and a Macintosh-style Mousepaint program for £930. A raw Apple IIe now costs £595 instead of £845 and if you already have a 64K Apple with disc the mixed hardware/software Mouse IIe package is extremely good value at £135.

Apple's mice with everything policy even extends to the new Apple IIc battery-operated portable. This is smaller than a portable typewriter and much lighter — just 7½ lb., yet includes a built-in disc drive and 128K memory. It is also much more expensive — £925. Until the liquid-crystal display panel for the IIc arrives in a few months typing in programs on the move will be a matter of guesswork, though it will plug into a TV at home, and the optional mouse may be a little bit difficult to use on your lap on a train or bus.



Epson — which has also announced a portable this month, the PX-8, has taken a different route based on the lessons of the Epson HX-20. Although the price is similar, £1,000, the PX-8 has just 64K of RAM and a minicassette instead of a disc drive. However, it has a pop-up eight-line 80-column LCD display as standard together with built-in word processing, spreadsheet and communications.

Life after the MC-10

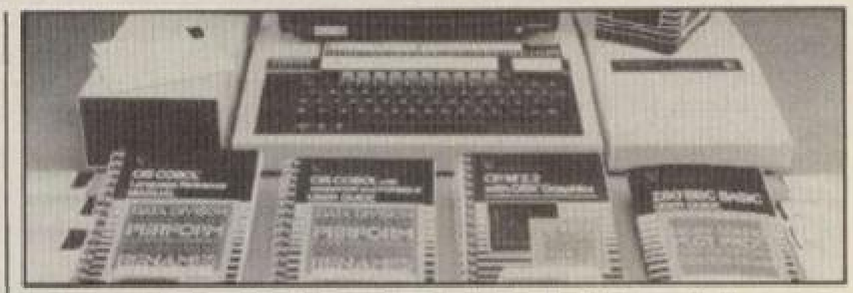
TANDY'S MC-10 colour computer introduced just over six months ago for £99 has already bitten the dust. Our review at the time in October 1983 described it as overpriced, a non-runner and a year too late. Now the last few MC-10s are being sold off for less than £40 each.

No product has been announced to take over from the MC-10 or its ancient bigger brother the Tandy Colour Computer. However, John Roach, Chairman of the Board of Tandy Corporation, is talking about introducing "adequate home systems for £500 to £1,000" consisting of keyboard, computer, disc drive, printer, and software.

Acorn's £300 Z-80 package will turn BBC into business machine

FOLLOWING ITS release of a 6502 second processor, Acorn has now launched a Z-80 version which turns the BBC into a CP/M-based business system. For £299 the unit provides 64K RAM and comes with a suite of programs that are intended to meet all the needs of the small business.

Acorn says that the software would be worth £3,000 if sold separately. Along with CP/M 2.2 which is supplied with the GSX Graphics System extension, the package includes word processing, database, spreadsheet and accounting programs, as well as Nucleus, a program generator.



Together with these application programs there are three languages — CIS Cobol, Professional Basic and a Z-80 version of BBC Basic. Professional Basic takes code generated by Nucleus and is also compatible with Microsoft Basic.

In addition to the bundled software it will also be possible to run many of the existing range of CP/M programs. Acorn has commissioned Software Ltd to configure its catalogue of 300 packages to BBC disc format.

The dual-processor system gives substantial speed improvements. By handing over all I/O processing — disc and screen handling — to the 6502 processor, the Z-80 is left free to concentrate on running programs. On top of this, the processor used is a Z-80B which runs 50 percent faster than the more common Z-80A.

Although the launch of his Enterprise home computer has been delayed till September Enterprise director and International Chess Master David Levy, at the chess board, still has plenty to smile about. Since the 1960s he has laid a series of bets that he could beat any computer at chess. Until last month's GEC Dragon Computer Chess Challenge no machine had ever had the better of him. The Dragon Chess Challenge proved to be no exception — Levy won again. Not surprising, you might think, if he was playing against a Dragon, but David was up against a Cray XMP mainframe — one of the most powerful computers ever built, and it was running the best computer chess program yet written — whose author Robert Hyatt is on the right of the picture with his terminal linked to the Cray.



Sinclair QLs arrive so do the complaints

FRANTIC DASHES in hired cars delivered the first few dozen QLs before midnight on the last day of April. So much for the good news — that the first QLs were delivered to customers a mere 11 and a half weeks after the 28-day delivery time elapsed. A Sinclair spokesman described this delivery as "quite genuinely a goodwill gesture".

The bad news is that the few QLs which have been delivered are not working properly. Apart from the overspill box plugged into the ROM socket — see QL review page 64 — which prevents you using plug-in ROMs, QL owners have been ringing up to complain about their machines. Shoddy finish and often unloadable software seems to be the least of their problems. The Screen Editor can make the system crash and the promised real-time clock is missing — along with the manuals.



It will be at least a couple of months until real QLs with the whole operating system on the main circuit board go out and Sinclair Research is hoping to iron out the bugs before that happens.

September MSX launch

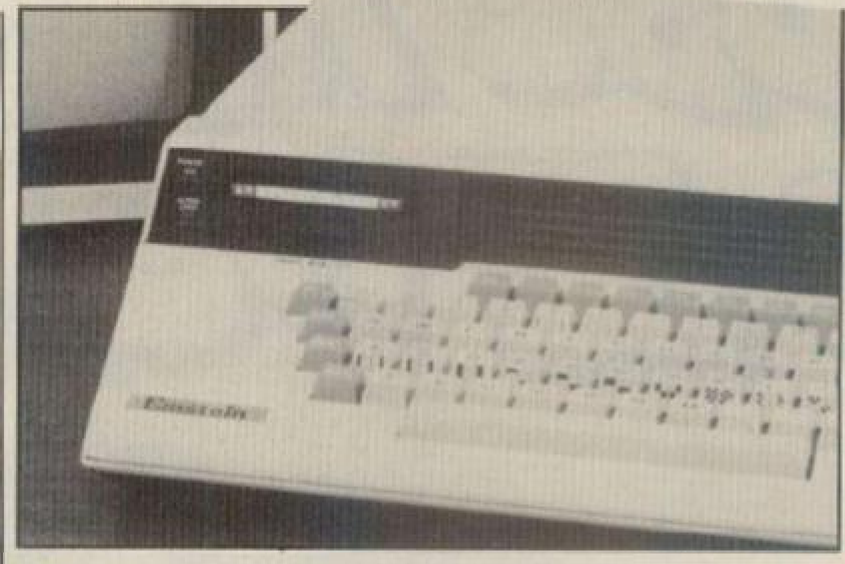
SECRET MEETINGS with software houses and Japanese manufacturers over the last two months have convinced Britain's biggest high street stores to back the oven-ready computers — MSX micros.

The shops have agreed to take hundreds of thousands of Sony Hit-Bits Sanyo MPCs, Toshiba Pasopias, Yamaha CX-5s and Canon V-10s starting from September, not to mention Hitachis, JVCs, and Mitsubishis. See *Your Computer* March 1984 pages 68 and 69. The stores are confident that the reputation of the Japanese for reliability plus the confidence of knowing that all the software is interchangeable will convince many sceptics to buy a home computer this Christmas.

Now they are pressurising software houses to convert all their best programs to MSX. One programmer told us bluntly: "the big multiples have said, 'You're writing for it!'" Meanwhile, Spectravideo, the company which launched the SV-318 and 328 nearly MSX computers is working on a cheap portable which really will run MSX programs this time.

Cooking with a computer conjures up images of the early days of the ZX-80 when overheating could be delayed by making hot drinks on the back of the machine. Now Bug-Byte has employed a chef, Ian Hoare, to produce a computer cookbook. You just tell the computer what you have in the fridge and it will suggest some suitable recipes. The program will even tell you what wine you should drink with your meal. It can select recipes by price, country of origin and how long the meal will take to cook. The Computer Cookbook which is only available on the Spectrum costs £9.50 for 80 recipes.





Tatung built-in disc was Einstein's secret

DESPITE ITS NAME the Tatung Einstein deserves to be taken seriously — if only because it is the first computer with a built-in disc drive to break the £500 barrier.

The Einstein has similar performance to the MSX micros, not surprisingly as it has a Z-80A central processor, Texas TMS-9129 video chip and AY-3-8910 sound processor but it has its own Tatung/Xtal Dos and Basic. There is 64K of RAM with an additional 16K video RAM and 8K ROM expandable internally to 32K. This gives it 256 by 192 resolution, 16 colours and 32 sprites with 40-column or 32-column text. 80-column display will be an option.

What makes it different is the built-in 500K 3in. Teac disc drive. This gives 200K per side formatted.

Tatung is a Taiwanese company, the name means Universal Family, and the company motto is "Honesty, integrity, industry and frugality". Tatung describes the Einstein as "all-British" but it might be more in line with the company motto to say it is designed and assembled in Britain.

The Einstein has a full typewriter keyboard, Centronics and RS-232 ports, A/D converter and Z-80 bus. A second disc drive can be fitted into the Tatung's case as well as up to another two externally.

New Dragons for our Fair

DRAGON IS LAUNCHING a new range of computers at our Computer Fair which opens at Earl's Court on Friday June 15. QLs will also be on display at this mixed hardware/software show backed by *Your Computer, Practical Computing* and *Computer Choice*. The Fair is open from 10am till 6pm Friday and Saturday and 10am till 5pm Sunday June 17. See pages 204-205 of this issue for further details.

Cheap games boom time

WHILE 99 PERCENT of the nation was enjoying this year's sunny spring, software house heads were doing a raindance. Every time the temperature rises games sales fall, as you throw your computers into the cupboard and head for the great outdoors. But companies like Mastertronic and Atlantis think they can beat the sales drought by dropping prices to £2 a time.

Mastertronic claims to have sold 250,000 cassettes in five weeks to unconventional outlets like newsagents, garages and even off-licences. Now Atlantis Software is following Mastertronic downmarket by launching a range of £2 games. If the price war takes off it could be a long hot summer for the established software houses.

Watch out, Martians have landed: War of the Worlds on a Spectrum

WHAT WITH interplanetary travel, tanks and time machines H G Wells never quite got round to inventing the home computer but if had, perhaps *War of the Worlds* would have come out first as a video game rather than after the book, film and record.

When Clement Chambers of Computer Rentals Limited wanted to produce a video game based on the Wells book he was not sure who to approach for the rights — but in the end it turned out that Jeff Wayne who made a *War of the Worlds* record in 1978 also had the game rights. Jeff took an interest in the project — as well as a cut in the take and themes from his record now accompany the 116 frames of action which allow you to roam around the whole of a desolate southern England under siege from the Martians.

You play the role of the journalist trying to survive and find out what the little green men are up to. You can use a joystick to control your movements as a text panel at the bottom of the screen tells you what your options are. In order to fit so many frames of action in, CRL had to "compress whole landscapes into very little information".

It was Clement Chambers first encounter with the record industry and he found the book-sized contracts he had to sign intimidating. "You just breathe out of time", he says "and you get done". The game of the record of the radio play of the film of the book will be available on Spectrum, Oric BBC, Electron, Commodore 64 and MSX. Anyone for posters and T shirts?

When NEC introduced the £85 PC-2021 battery-operated Centronics printer late last year it received an enthusiastic welcome from Your Computer. *Now NEC has put it together with a tape recorder and the PC-8201 hand-held micro to make a go-anywhere system which weighs just 6lb — even if it costs £600.*



25 BBC MICROS TO BE WON!



WALL'S ICE CREAM AND ACORN COMPUTER INVITE SCHOOLS TO DEVISE A COMPUTER GAME

Here's a great chance to win one of 25 BBC Microcomputers (B) for your school.

To celebrate the launch of the new MegaBytes lolly, Wall's and Acorn are offering these superb micros free to winners of this 'Mega' competition.

The competition is open to all UK primary, secondary and special schools.

To enter, each school team must:

1. Devise a computer game program which features ice lollies and;
2. List as many words as possible using letters from the phrase: 'Wall's and Acorn'.

There is no limit to the number of entries per school but each entry must be accompanied by fifteen MegaBytes lolly wrappers and arrive by 28 July 1984 at MegaBytes, PO Box 4XZ, LONDON W1A 4XZ.

Entries will be judged by a young computer games author and a team of professional programmers from Acornsoft. Points will be awarded for originality; quality of graphics; speed; sound effects; playability and overall presentation with attention to detail.

To win a computer, your school entry must have a high scoring game program and a sufficient number of words.

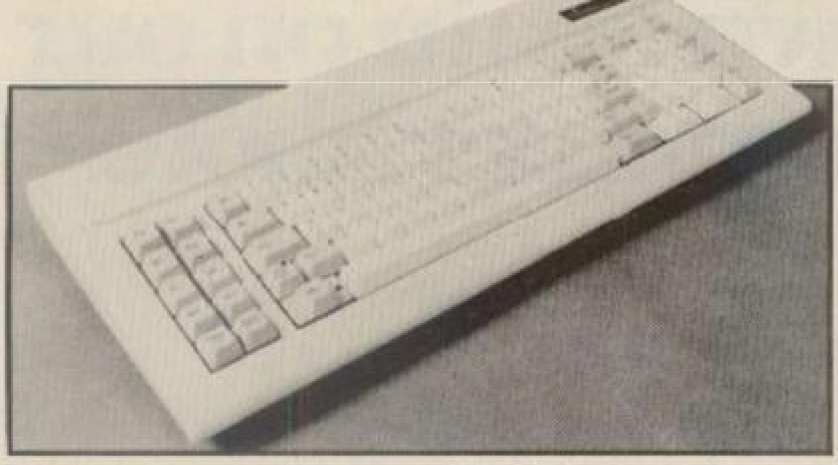
FULL RULES

1. Entries can be submitted on cassette or disk and written in either BBC Basic or machine code, each entry being signed by the teacher of computer studies or head teacher of the school. Entries should run on a BBC Microcomputer Model B or Acorn Electron.
2. All games must be clearly identified and accompanied by a full printed listing as well as a games catalogue style description of the game (not more than 200 words). The cassette/disk and listing should each carry the entrant's name and address.
3. Each school may only win one prize, irrespective of the number of entries of games submitted. Entries will be acknowledged upon receipt but not returned. Correspondence will be entered into at the absolute discretion of the promoters.
4. The entry instructions constitute part of the competition rules and are binding upon entry.
5. Responsibility cannot be accepted for entries lost, damaged or delayed in transit to the competition address. Illegible or altered entries will be disqualified, as will those not conforming to the entry instructions.
6. Entries will be judged by a panel of judges which will contain at least one independent member not connected with the promoter. The decision of the judges will be final and legally binding and in all respects of the competition the decision of Birds Eye Wall's Limited shall be final.
7. Copyright in all material entered rests in Paragon Communications on behalf of Birds Eye Wall's Ltd., and Acornsoft Ltd.
8. Winning schools will be notified as soon as possible after the closing date. A list of winners will be sent to anyone who encloses a stamped addressed envelope with their competition entry.
9. Entry is open to all qualifying UK residents except for employees of Birds Eye Wall's and Acorn Computer, their advertising and promotion agencies, or anyone directly connected with the competition or their families.









Rabbits may need MSX jabs to survive in British climate

RABBIT'S WRAPBIT II is a Z-80 based 80K Kong Kong built machine due to arrive in our shops this autumn. Like so many other machines it has opted for a Z-80 plus the standard Texas graphics and General Instruments sound chips.

Rabbit's parent company in Hong Kong, Foton is known to be negotiating to join the MSX club which has led to speculation that the Wrapbit might be MSXed before it is officially launched in this country. Rabbit claims that the £250 Wrapbit is Coleco-compatible and will have a CP/M option.

Case remains the same as CBM-16 replaces Vic

COMMODORE is replacing the aging Vic-20 with the 16K Commodore 16. In America the price will be $100 which will probably translate to £90 if the 16 is launched here this autumn. But Commodore is famous for announcing products which never see the light of day — like the £100 Commodore Max announced in April 1982, so don't hold your breath.

Although the 16 will come in the familiar Vic-20/CBM-64 plastic case it will be related inside to the new Commodore 264 micro now also known as the Plus 4 which will offer 60K free memory, built-in word processor, spreadsheet, filer and graph drawer programs for $300 — £280. Any software for the 16 will run on the 264. Commodore expects to sell over two million computers worldwide this year.

YOUR COMPUTER TOP 20

Game	Company	Machine
☐Blue Thunder	Richard Wilcox	Spectrum
☐Chequered Flag	Psion	Spectrum
☐Chuckie Egg	A&F Software	Dragon
☐Demolator	Visions	BBC
☐Eightball	Microdeal	Dragon
☐Falcon Patrol	Virgin	CBM-64
☐Flight Simulation	Sinclair	ZX-81
☐Fortress	Pace	BBC
☐Hunchback	Ocean	CBM-64
☐Hunchback	Ocean	Spectrum
☐Jet Pac	Ultimate	Vic-20
☐Jet Set Willy	Software Projects	Spectrum
☐Krazy Kong	PSS	ZX-81
☐Mr Wimpy	Ocean	CBM-64
☐Orc Attack	Atari	Atari
☐Q Man's Brother	MRM	BBC
☐Snooker	Visions	Vic-20
☐Ugh	Softech	Dragon
☐Wizard & The Princess	Melbourne	Vic-20
☐Zaxxon	Centresoft	Atari

Legal, decent honest...

UP FIVE PLACES in this year's Advertising Standards Authority bad boys chart go computer adverts. In 1982/83 there were enough justified complaints about misleading adverts by micro software and hardware companies to scrape into the ASA top 10.

This year's chart covering March 1983 to March 1984 has just been compiled and the bad news is that complaints about computer ads have overtaken Photography, Furniture, Services and Property to take the number 5 position. You don't need a micro to work out that at that rate of progress computers could soon overtake Finance, Travel and Holidays to topple cars and garages from the number 1 spot.

Sinclair, Acorn, Commodore, Dragon and Oric have all had complaints against them investigated and upheld by the authority. Most of the complainants claimed that the adverts were misleading or that products had not been delivered within 28 days. Peripheral manufacturers like Fuller were also criticised by the ASA.

Advance into IBM land try your discs at Smiths



AT LAST THE ADVANCE has gone on sale. Ferranti, who will be manufacturing the computer expects to make 100,000 this year — up to half of which could be sold in Britain by W H Smith.

For a fraction of the price of a PC the Advance is IBM-compatible which in this case means it will run most IBM programs — including Lotus 123 and Flight Simulator which often catch out IBM lookalikes. Advance director Jack Dangoor admits that a man who came to see him with a farming program that recognised cows on an IBM PC could not get it to run on the Advance so W H Smith will be encouraging potential customers especially farmers to try out any IBM software that they are thinking of buying on an Advance in the shop first.

Smiths will be selling both the cassette-based £400 Advance 86A, reviewed *Your Computer* May 1984, and the disc-based £1,500 86B. They both have an 8086 processor and 128K but the B also comes with two disc drives, a word processor, spread sheet, database and spelling checker.

Amstrad man puts his stomach on the line for delivery

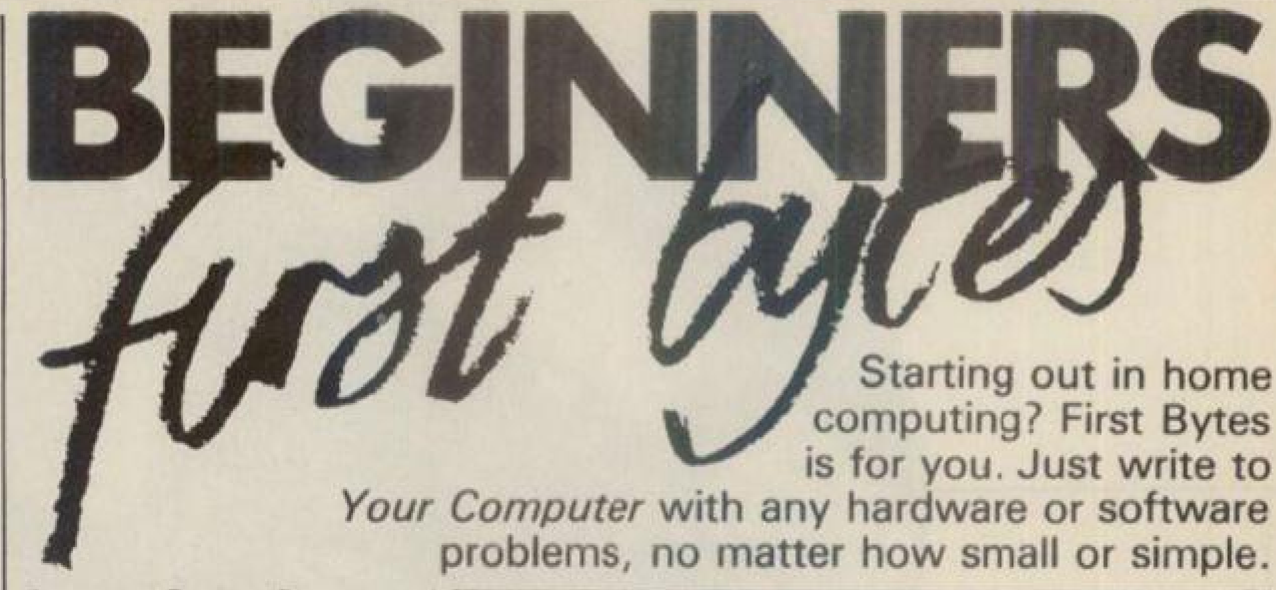


WILLIAM POEL Amstrad's software division general manager is so confident that the CPC-464 will be out on time that he says: "I will be prepared to sit down and eat one in Trafalgar Square if its late. Dock strikes and Russian aircraft attacks permitting we will be in the shops in June." The *Your Computer* snatch squad will be waiting in the shadow of Nelson's column at dawn on July 1 in case Amstrad fails to make the deadline.

One *Your Computer* reader is already cutting his teeth at Amstrad. Alexander Martin's Da Vinci entry was commenced in our April 1984 Design a Micro round up. It also carried a personal message "Product design graduate — job needed". When he went for an interview with Amstrad soon after the magazine came out it helped him to get the job. "At the interview he waved a copy of *Your Computer* at us", says William Poel "and we'd seen it the day before so it was fresh in our memory."

Microvitec's new dual disc drive for the Dragon is not cheap — £525 — but it adds a massive 1 megabyte of storage, 720K formatted, to your 32 or 64. Microvitec is on 0274-390011.





Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

I could do that...

For this month's task we would like you to equip your computer with a glimmering of artificial intelligence. Write a program which allows you to carry on a dialogue with the computer. It should start off by asking the user a question and then respond to the answer, keeping it up for at least four exchanges. The program should not be longer than 20 single statement lines, including data statements.

We will award the £15 prize to the program whose questions and responses are judged to be the most amusing, or apparently intelligent.

Program 1.

```
 10 REM**DOT-MOVER**
 60 MODE7
(60 CLS)
 70 LET A=10
 80 LET B=10
 85 REM** A, B ARE START
POSITION**
 90 PRINT TAB(A,B)"*"
(90 PRINT AT B,A;"*")
(95 IF INKEY$="" THEN GOTO 95)
100 LET C$=GET$
(100 LET C$=INKEY$)
110 PRINT TAB(A,B)"."
(110 PRINT AT B,A;".")
115
REM*5-LEFT|8-RIGHT|7-UP|6-DOWN*
120 IF C$="5" THEN LET A=A-1
130 IF C$="8" THEN LET A=A+1
140 IF C$="7" THEN LET B=B-1
150 IF C$="6" THEN LET B=B+1
160 IF A<1 THEN LET A=1
170 IF A>38 THEN LET A=38
(170 IF A>30 THEN LET A=30)
180 IF B<1 THEN LET B=1
190 IF B>23 THEN LET B=23
(190 IF B>19 THEN LET B=19)
200 PRINT TAB(A,B)"*"
(200 PRINT AT B,A;"*")
210 GOTO 100
```

Logical operators?

"What exactly are 'logical operators' used for?"

MOST BEGINNERS don't take long to learn to use the relational operators. These are =<> > < <= and >=. Their use with arithmetic variables, such as:

110 IF Q<20 THEN GOTO 70

is soon extended to string variables, like:

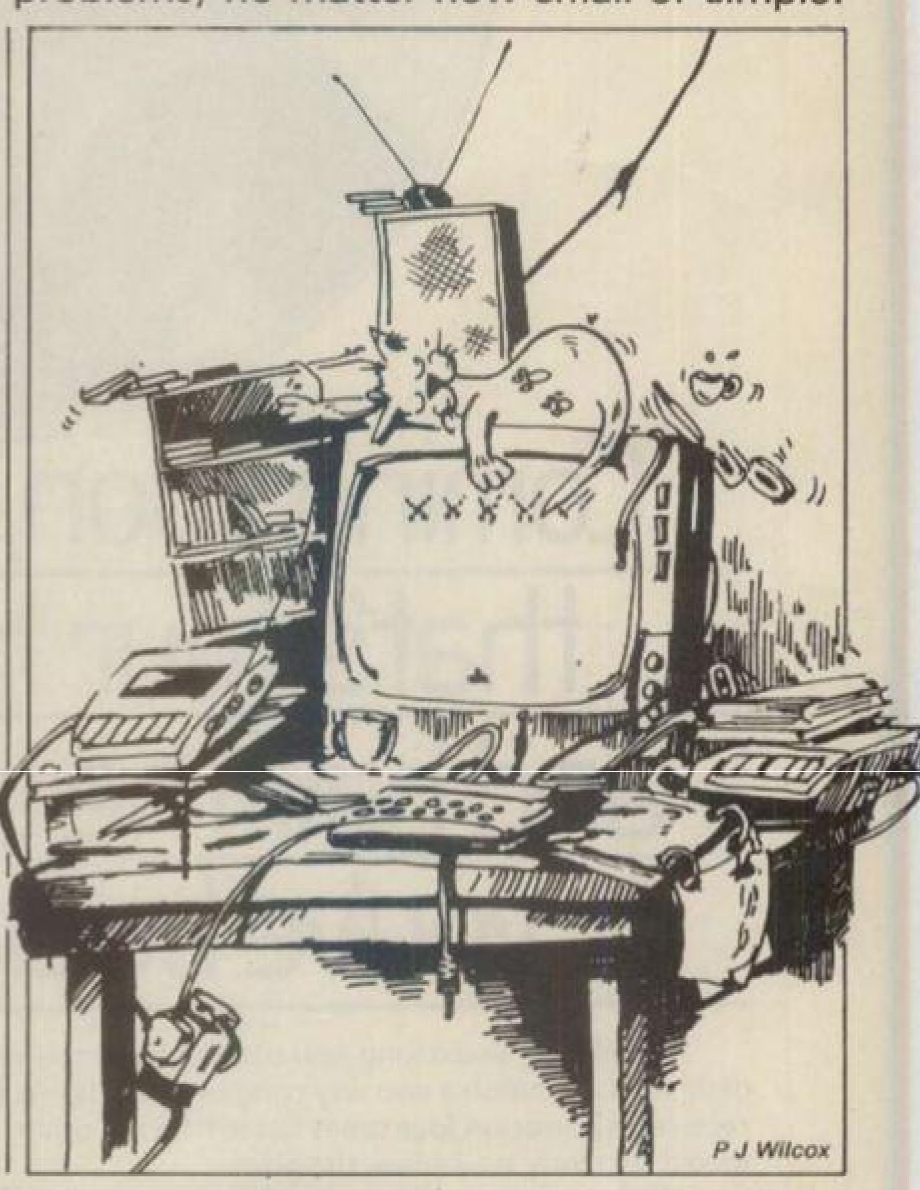
430 IF N$ = "SMITH" THEN PRINT N$,T$

The use of logical operators such as And Or Not EOR takes longer to grasp. The problem is complicated by the fact that different micros use them in different ways, and the fact that the rules which underly their use come from one of the more obscure backwaters of mathematics; Boolean algebra. But whatever the theory, the use of Logical Operators can lead to very neat program routines.

Try the programs with this article. As printed, they will run on a BBC micro, a ZX-81 or a Spectrum, and they should be easy for beginners to modify them to run on many other machines.

The first program moves a star around the screen, leaving behind a trail of dots. ZX lines are in brackets.

(continued on page 51)



P J Wilcox

Disc operating systems

"What is a disc operating system and what does it do?"

A DISC OPERATING system — DOS — is simply a machine-code program — usually 8K long — which handles loading and saving to disc. Most home micros come without a disc operating system so if you want to add a disc drive you will also have to buy a disc interface with the DOS stored on ROM.

On the Spectrum, for example, the DOS for the Microdrive is supplied with the Interface 1, while BBC owners have to plug a DOS chip into the main board. Commodore, however, incorporates the DOS within the disc drive.

Business micros, by contrast, generally store the DOS on disc. They hold a short routine in ROM — a bootstrap routine — whose purpose is to load the DOS into RAM when the machine is powered up. This is the method used to run CP/M, by far the most popular eight-bit operating system.

Disc operating systems provide a far greater range of facilities than their cassette counterparts. Perhaps the most important difference lies in the way the DOS keeps track of what is stored on disc and where.

Consider what you have to do before saving a program to tape: you need to make a note of where other programs start and finish, and of how much space is left on the tape; you need to physically position the tape at the right spot. A disc operating system does all this for you.

It reserves space on the disc for a directory in which it stores details of where programs are stored and how long they are. When you come to save a new program the DOS finds space for it and adds its details to the directory. If the disc is full it tells you so. When you load in a program the DOS consults the directory to find its location.

In this way the DOS performs what are often called its housekeeping duties. Not having to worry about such chores is one of the great advantages of disc systems over cassettes.

On top of this a good DOS will offer an extensive spread of commands and utilities. Naturally, these vary from DOS to DOS. They should include commands to delete selected files on an entire disc, and facilities for copying files either to another disc drive or to another disc inserted in the same drive.

There will also be a set of commands for creating data files. These will allow you to read in a series of records — sequential files — or pull in specific records out of order — random-access files.

Other facilities may be for renaming programs, protecting them, setting up different program libraries, or tidying up the disc by rewriting files head to tail. To find out more you will need to take a look at a DOS manual. You may find that learning to use a DOS fully is almost as demanding a task as mastering the computer itself.



Coming soon, a new Modem that's four times as fast and half the cost of the one you've been looking at.

Introducing an exciting new concept in computer communications—the Protek 1200 Modem. Specially designed to establish a two way computer link-up via the telephone, the Protek Modem transmits and receives information four times faster than any other model currently available at the price.

With so much to offer at such a competitive price, the Protek Modem is well worth waiting for. But don't worry, you won't have to wait too long.

- **Two operating speeds: Mode 1 1200/1200: Mode 2 1200/75**
- **Accoustic coupling**
- **Flexible design for perfect acoustic connections**
- **Battery powered (40 hours from 4AA 1.5V battery)**
- **LED indicator**
- **Available for delivery 1st June 1984.**

Protek 1200 Modem— £59.95

CONNECTS TO ANY RS232C COMPATIBLE COMPUTER	
SPECTRUM	(INTERFACE REQUIRED)
ORIC	(INTERFACE REQUIRED)
BBC	(CABLE REQUIRED)
ELECTRON	(INTERFACE REQUIRED)
VIC 20	(CABLE REQUIRED)
COMM. 64	(CABLE REQUIRED)







Protek Computing Ltd, 1A Young Square, Brucefield Industrial Park, Livingston, West Lothian. 0506 415353.

(continued from page 49)

Look at program 1. Easy to follow, but all those If...Thens! Now erase lines 120 to 190, and type in the two lines in program 2 instead.

I hope you agree that this makes the program shorter, neater, and therefore better. ZX programs can be made even neater, but by using ZX Basic in a way which is not allowed on most other machines. 120 LET A=A+(C$="8" AND A<31) - (C$=...etc.

To follow the logic read line 120 as:

"Let A become A+1 provided C$ is 8 and provided A is less than 38; and let A become A−1 provided C$ is 5 and provided A is greater than zero."

Using OR needs much more care. With most Basics, watch out for double negatives — what your old English teacher said may have seemed pointless in everyday life, but it really does matter here. Another ghost from the past; in most Basics, OR is like the "either ... or ..." comparisons of English, and compares just two things. Forget this at your peril! However, unlike English, in Basic you can string together logical operations using brackets. You can have:

```
340 LET K=K - (1 AND (C>7 OR
      C<19) AND L$<>"*")
```

Back to the little dot moving program. You can try changing lines 120 and 130, to allow you to move along diagonals — see program 3.

Experiment with the programs, and make sure you understand how the logical operations work. Next, look out for them in program listings for your own machine. That way you are likely to get some fresh ideas to use in your own programs. You may find examples of the use of Not. See if you can work out why they used this rather than <>.

Program 2.

```
120 LET A=A+(1 AND C$="8" AND
A<38)-(1 AND C$="5" AND A>0)
130 LET B=B+(1 AND C$="6" AND
B<23)-(1 AND C$="7" AND B>0)
(A<31 and B<20 with ZX machines)
```

BEGINNERS first bytes

Program 3.

```
 120 A=A+(1 AND (C$="8" OR
C$="9" OR C$="0") AND A<38)-(1
AND (C$="5" OR C$="4" OR C$="3")
AND A>0)
 130 B=B+(1 AND (C$="6" OR
C$="4" OR C$="9") AND B<23)-(1
AND (C$="7" OR C$="3" OR C$="0")
AND B>0)
 120 LET A=A+((C$="8" OR C$="9"
OR C$="0") AND A<30)-((C$="5" OR
C$="4" OR C$="3") AND A>0)
 130 LET B=B+((C$="6" OR C$="4"
OR C$="9") AND B<20)-((C$="7" OR
C$="3" OR C$="0") AND B>0)
```

What are bit-mapped screens?

"Would you please explain what is meant by a bit-mapped screen?"

To UNDERSTAND the idea of a bit-mapped screen you need only to remember that each byte of memory is made up of eight bits, and that each bit can have one of two values, 0 or 1.

In a bit-mapped screen each pixel on the display is represented by a bit or several bits in memory. Thus the pattern of binary 0s and 1s in the screen memory copies the pattern of dots on the screen.

In the simplest case where a pixel can only have one colour — is either off or on — only one bit is needed to register the state of one pixel; so a line of eight pixels would be stored in the screen memory as binary 1111111, or 255 in decimal.

Bit-mapped screens permit higher resolution than character-mapped screens but consume much more memory. Characters are usually defined on an 8 by 8 grid of dots so storing the dot pattern for a character will require 64 bits which is eight bytes. Contrast this with a character-mapped screen where the code for a single character is stored in a single byte.

To work out just how much memory a bit-mapped screen will take up you simply work out how many pixels there are, allow one bit for each pixel and divide by either to find the number of bytes. Mode 0, for example, on the BBC gives a resolution of 640 by 256. Multiply these two numbers together and divide by eight and you will arrive at a figure of 20480. Divide this by 1024 — the number of bytes in one K — and you finish up with 20K which is the amount of RAM used by Mode 0.

If you also want to store information about the colour of a pixel you will need even more RAM. If each pixel can have one of four colours including the background colour then twice as much memory is required since two bits now need to be allocated to one pixel.

This explains why on the BBC the four colour Mode 1 uses as much RAM as Mode 0 although it only offers half the resolution. There is trade-off here between colour and resolution: the more colour the lower resolution, and vice versa.

The Spectrum circumvents this problem by using an attribute file separate from the bit-mapped display file. Each byte in the attribute file contains the details of colour, brightness and flash status for all the pixels within a character space.

Although it minimises memory consumption the drawback to this method of storing colour information is that it means you can only have one colour within a character space. This gives rise to the effect — often noticeable in Spectrum games — of having blocks of colour from different shapes overrun each other.

A further complexity of bit-mapped displays is the way in which the bytes in memory are laid out in relation to the pixels on screen. You might think the simplest method was to have consecutive bits and bytes store the details of consecutive pixels running from left to right, row by row from top to bottom. But it rarely works out this way.

Poking consecutive bytes in the screen memory on the BBC fills out not a row but a character space at a time. The Spectrum's screen memory organisation is even more complex. The first 32 bytes correspond to the first row of pixels but the second 32 store the pattern of the ninth row down — the first row of the second character line.

All this makes dealing directly with bit-mapped screen memories — by Poking or Peeking — slower in Basic than using Plot or Print commands. Machine-code programmers, however, have no option, and one of the machine-code gamesters first tasks is to work out an algorithm for plotting to the screen.

Either way you can investigate the complexities of your screen layout by simply Poking the first thousand bytes of screen memory with 255. By noting the order in which the pixels fill up you can then observe your computer's screen organisation in action. ■

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If you have anything of interest to tell us about your computer club why not contact us on 01-661 3144.

Local news

Llanelli

If you have a computer and are wondering what you can do with it other than play games, then Llanelli Computer Club is the place for you. Whichever make you have, there will be someone else with whom you can discuss and grumble about the different features of your machines. Anyone who is interested is invited to come along and see for themselves. The club meets every Friday evening at 7 pm at the Mutual Aid Shop, John Street, Llanelli. Contact Trevor Walters, or Ray Collins on 05542-56917.

Oxford

Neglected machines though they be a hardcore enclave of TI-99/4 and TI-99/4A users has formed in Oxfordshire. Oxon TI Users has a montly newsletter called *TI-Lines* which has one unusual feature: it is read on to audio cassette for the benefit of blind/partially-sighted users. Contact Peter Brooks, 29 Kestrel Crescent, Blackbird Leys, Oxford OX4 5DY. Telephone 0865-84811, or 0865-717985.

Tyne & Wear

Newcastle-upon-Tyne Personal Computer Society meets at Room D103, Newcastle Polytechnic on the first Tuesday of every month. They try and organise some sort of demonstration every month. There is a wide range of machines from ZX-81s to sophisticated business machines. Contact Pete Scargill, 21 Percy Park, Tynemouth. Telephone 0632-573905.

COMPUTER club

What do John Milton and browse options have in common? After a flying visit to the Chilterns Paul Bond is in a position to reveal all.

CHILTERN MICROCOMPUTER Club, held on the first Wednesday of every month at the Old Garden Centre, School Lane, Chalfont St Giles, Buckinghamshire has the unusual distinction of meeting not far from the home of John Milton, 1608-1674, of *Paradise Lost* fame. And while not exactly a feast of nectared sweets where no crude surfeit reigns, coffee and buscuits are nevertheless provided, to give people a chance to exchange ideas before the main business of the evening; usually a lecture or a look at some piece of computer hardware — either a new home computer, or perhaps a business machine that other club members are interested in seeing.

The club does not limit itself to any particular machine or interest area. Nevertheless, they have been in the unfortunate position of having to discourage younger members because, due to rural transport problems, this would necessitate meeting at an earlier time. It would also influence the nature of topics covered in the meetings.

Wendy Tibbits, secretary of the club pending the annual general meeting, was also its founder. An ex-mainframe programmer, she now does freelance software writing from home so that she can devote more time to the family. She even advertises within the pages of *Your Computer*.

The club chairman, Ian Spedding, joined the club at its inception two years ago but was, in fact, standing in for his son who had gone to university by the time regular meetings got underway.

He explained that the club, apart from looking at every kind of machine from the Memotech MTX-500 to the IBM PC, had done things like organise an introductory seminar for people who had never written a single program instruction. Held in January of this year, the session dealt with very basic things like how to tune a television set into the microcomputer and worked up to a 15 instruction program which was worked through one step at a time.

Club members comprise a high proportion of people involved in data processing or business applications of computers — Ian Spedding himself is a systems analyst — but also people who are interested in micros purely from a hobbyist viewpoint.

The club also provides a bit of a pressure group on the local schools who, it would seem, have been a bit slow off the mark when it comes to seizing the challenge proffered by new technology, letting those government grants for microcomputers just slip away. If teachers have a mental block against computers, their pupils will suffer.

Although the club does not print a newsletter, the noticeboard keeps it in touch with developments like Micronet 800's Freebie of the Month competition — a possible £100 prize here for BBC or Spectrum programmers together with the possibility of a club modem — for more details telephone 0733-63100. Also Interdisc Records of 249-251



Kensal Road are moving into software and want programmers subsequent to their deal with EMI and Island.

The evening's talk was given by Bob Finch, a local businessman. His field is really radio-electronics but he got into computing after getting a contract for a hospital radio system run by a PDP-11/05. "I had to learn to drive it." Shortly after this his children started computer studies at school so he went in for a BBC Micro.

The machine he used for most of his business purposes, however, was the somewhat more exalted ICL model 26. This could be run with two screens and two printers one dot matrix and one Olympia Typewriter. On this he did price-list, letters and accounts. He had customised a WordStar program, rewritten by a friend. It had softkey functions making it very user-friendly. Since the program is menu driven you can rename, copy, delete files etc.

For data management he used a program called Delta. This simply writes serial files on a disc. You have to define the key field — character, numeric, data — the record and how to get into the file. The program has a choice of five browse options. This means different parameters can be selected in order to locate things if you can't remember all the details. This kind of program is used by mail order companies. For more details of Chiltern micro club contact Mrs W Tibbits on 024 074906. ■

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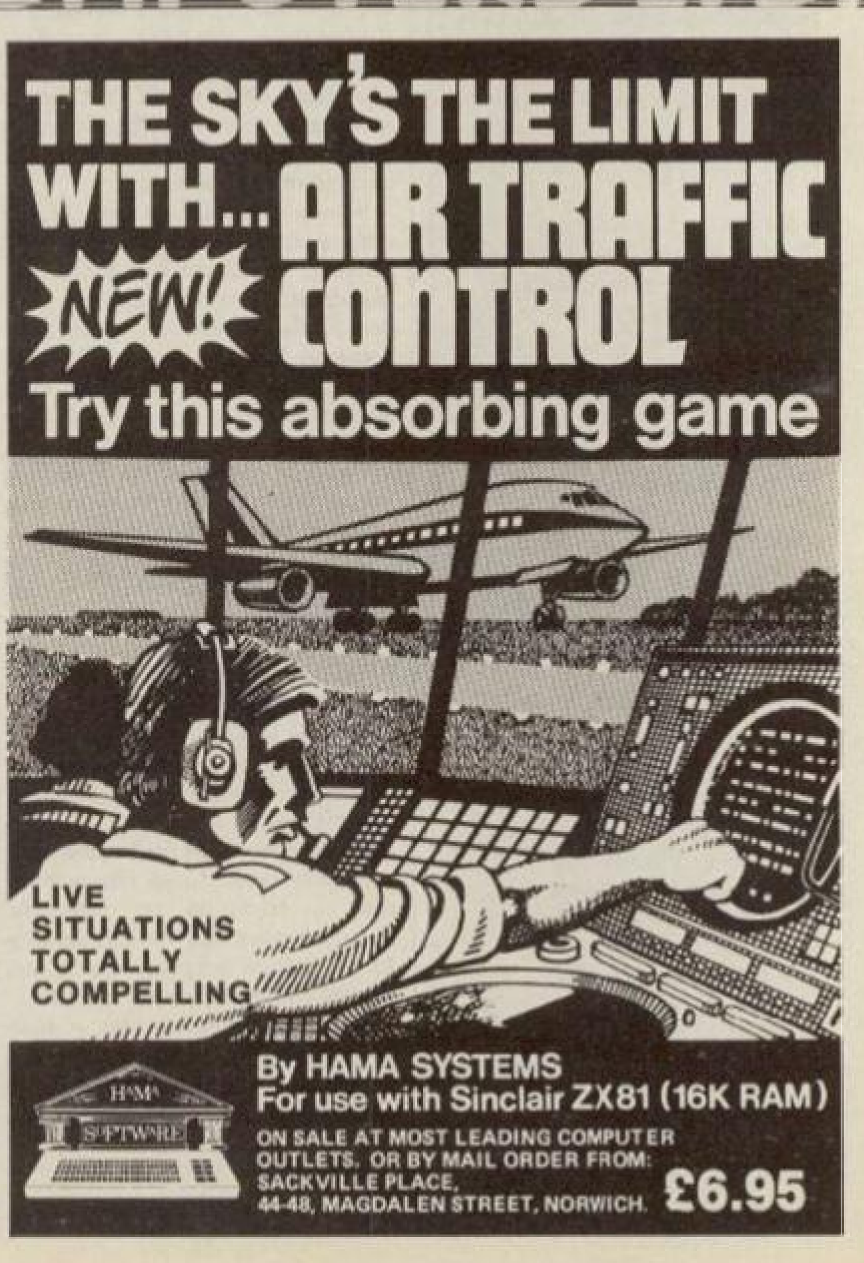
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Star★chart

Zigzag

Spectrum 48K:
Novelty:
£6.95:
DK'tronics:



You must chase Scarabags in your Vectrakker DKT Mk II prototype and, once you've cornered one, interrogate it to find out how to enter the next sector. Then kill it. Occasionaly, Hoverdroids appear and you must destroy these too. A 3D maze effect and speech module capability make this an unusual game. The Scarabags, quaking in a corner, made me feel sorry for them — I didn't exterminate many.

Ad Astra

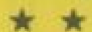
Spectrum 48K:
Shoot-'em-up:
£6.95:
Gargoyle Games:



This game looks better than it actually is — the graphics are very good but the scenario is an old one. Blow up the alien hoardes and survive the asteroids. At least the game is in perspective and this raises it above the standard shoot-'em-up fare.

Laserwarp

Spectrum 48K:
Shoot-'em-up:
£6.95:
Micro-gen:



Destroy nine waves of attackers including Interstellar pogos and hyperspace chickens before encountering the Master — destroy his ship for bonus points. A slow and boring Galaxians-type game.

Croakit

BBC B:
Novelty:
£5.95:
Kerian:



The cassette only version says on the cover card: "Probably the most exciting version of the well known arcade game". I disagree. The music is as boring as most, but the river traffic has a slight difference.

SOFTWARE Shortlist

Night Gunner

- *Spectrum 48K*
- *£6.95*
- *Digital Integration*



FROM THE PEOPLE who brought you the excellent Fighter Pilot F-15 Eagle simulator, this program obliquely relives the experiences of a World War Two air-gunner on a bombing mission over enemy territory.

Three types of mission are available. First you defend the bomber from nightfighters. Twin engine aircraft swoop towards you as you manipulate the keyboard/joystick to get them in your sights. The delicate tracery of bullets weaves a fine mesh of death in the night sky. Oops, getting carried away there.

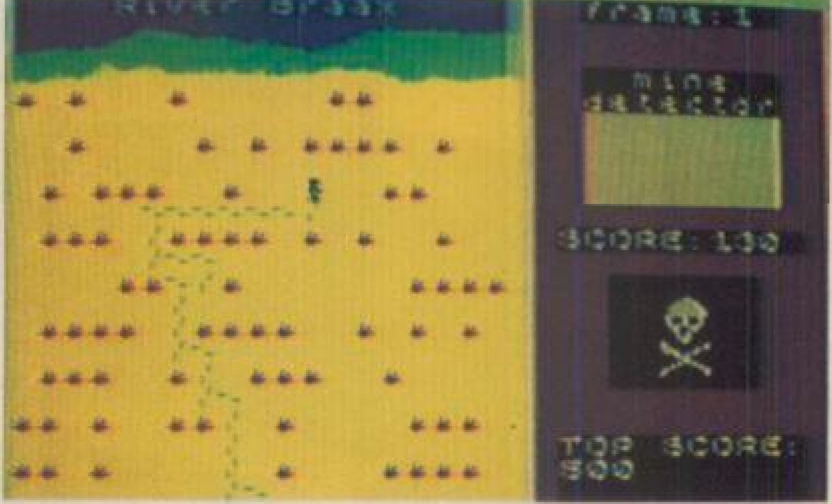
There is also a variety of ground attack options. As you unleash your cargo of destruction on the unsleeping factories of the enemy your view of the terrain is occasionally obscured by clouds. You can manoeuvre looking for a break in the cloud-cover.

The ground attack display shows you planes and sometimes lorries on the ground. You strafe them mercilessly with rockets, but watch your altimeter in case you turn your plane into a rather expensive lawnmower.

Plane damage is caused by attack from enemy aircraft or being hit by flak on the bombing runs. The plane's status panel at the bottom of the screen displays damage on an aircraft symbol. Time to target or end of mission are also displayed in seconds as is time remaining during ground attack. You periodically get messages from the captain during the mission.

Damage to the flight deck results in random movement of the aircraft making it difficult to hit your targets.

The sight on the ultimate mission is different from the others, in true Barnes-Wallis style. Adjusting your height so that the two spots on the screen form a figure of eight, you line up the two bars on to the centre of the towers and release your bomb. Barrage balloons and bonus planes periodically cross the sky.



Dyslexia Beater

- *Spectrum 48K*
- *£9.95*
- *Dunitz Software*



"SIGNIFICANTLY, MANY of the programmers I have met seem to be dyslexic to some degree." Thus Dr Beve Hornsby in her new book *Overcoming Dyslexia.* The relevance to this column is that Dyslexia Beater is a series of three addictive, easy-to-play arcade games created by educational psychologist Dr Colin Terrell and his colleague Charles Smith designed to accompany the aforesaid book.

The programs aim to help youngsters develop good letter recognition skills and sense of direction. Directional confusion from being uncertain of which is left and right to being unable to read properly is a common symptom of dyslexia. It appears to be a hereditary condition.

The first game, Desert of Durg, appears to cater for directional confusion. You have to guide Dyslexia Beater to the River Braax, avoiding mines and, on later screens, monsters. It is a standard format game of the type that presents you with a map of a minefield. You tiptoe round this using the keyboard. Then you have to do it again — but this time the mines are invisible. You have to follow the instructions which are displayed on the right-hand side of the screen. They warn you that mines are to the right, left, above, below. The pink monsters which appear later mean you have to do a bit of strategic thinking to figure out how to avoid them.

Crossing the Braax is the second game. This deals with letter recognition. You build a bridge by catching letters falling in yellow boxes that are the same as your moving target or letter-catcher. Each correct catch builds up an arch, scores 30, erases the falling letter's yellow box and changes the letter you are using to catch identical letters with.

This is an excellent idea and quite a good game in its own right. The only quibble I have is that it might be a little wearing on the eyes, due to the Spectrum's character set. If you are seriously going to use this with dyslexics, you will have to get hold of a big monitor.

The third game, Escape from Dyslexon, necessitates steering Dyslexia Beater's rocket ship through the green space gates, while observing direction instructions — a kind of primitive Scramble with the computer playing backseat driver. You get vaporised if you are hit three times by stars or the red space wall. The program is menu-driven so players can access any game at the touch of a button. The price of book and tape together is £12.95. The telephone number of Martin Dunitz Ltd is 01-482 2202.

(continued on page 57)

Star★chart

Submarine Strike

Spectrum 48K:
Novelty:
£6.95:
Pulsonic:

★★

Hi there! Good shooting captain! Enemy plane Destroyed! Variable not found, 7410:2. These are just some of the messages that greet you as you play this simple game of submarine warfare. You get the standard instrument display, map display, periscope display. You shoot down enemy planes — don't forget to load — and also sink tankers, flat-tops, etc. You have to aim off to the left for some reason which adds an element of trickiness.

Knight Driver

Spectrum 48K:
Racing:
£8.95:
Hewson Consultants:

★★

A breakneck racing game which gives you a downward looking view of a tortuously-twisting race track. Accelerate, decelerate turn accurately left and right. Don't hit anything.

Good for your reflexes, but I found I tired of it somewhat rapidly.

Jammin'

CBM-64:
Novelty:
£6.90:
Task Set:

★★★

A real blaad claat of a computer game, this ethnic little number has you guiding Rankin' Rodney through the top 20 mazes to number one. Done out in true Rastafarian colours plus blue for some reason, the maze is divided into four sections. You have to collect instruments from the four corners of the display and return them to the centre of the screen, avoiding spiders and bum notes, and voodoo skeleton men.

A simple idea, elegantly implemented. Avoid overconfidence. The harder they come, you know?

(continued from page 55)

Frogger

- *Atari*
- *£34.95*
- *Parker*

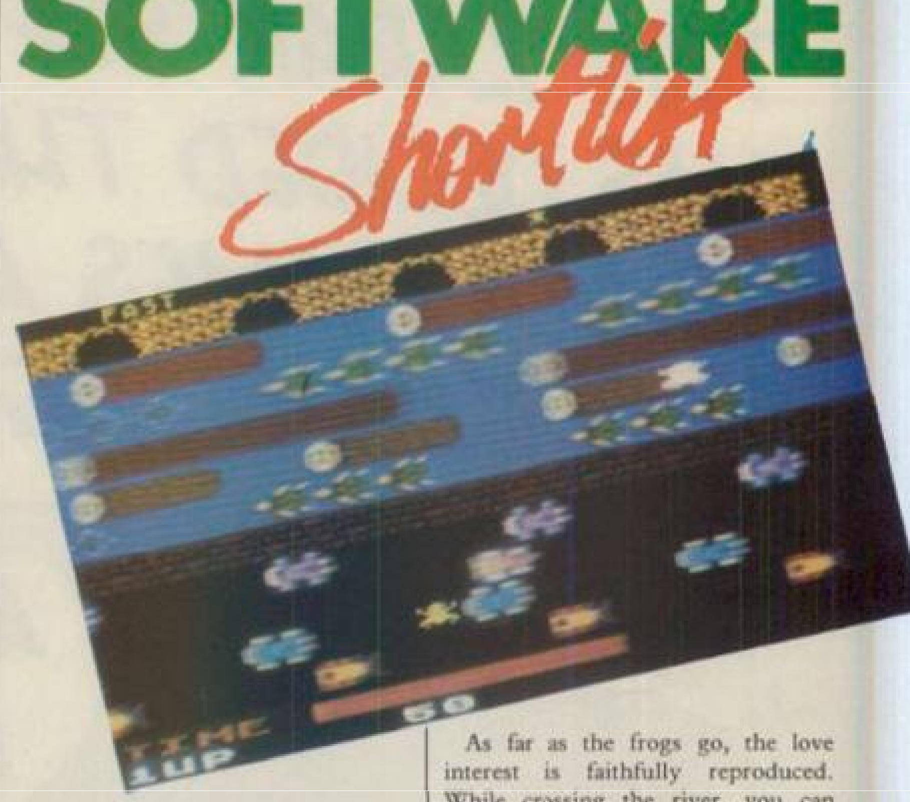
★★★★

BRILLIANT GRAPHICS, increasing complexity and enhancement of game interest factors — it's all here and at this price so it jolly well ought to be. Parker are very cagey about how much this cartridge is likely to retail for, so you might see it around for £29.95. But still — you can buy a whole computer for that much.

The object of the game is to hop as many frogs across the road and the river to safety as you can. This cartridge will fit into Ataris 400, 800 or XL and then you are plunged into life in the fast lane with a vengeance. When the music starts, the time band at the base of the screen starts to shrink. Your amphibian will become an ex-frog if he touches any vehicle in the four lanes of traffic; and when it comes to crossing the river, treacherous turtles sometimes submerge — apparently this frog cannot swim. As the game progresses, some of the logs become alligators hungry for frog aperitif. Alligators' heads also show up in the home bays occasionally. After you get five frogs home, the game continues at a higher level — speed and density of the traffic and river objects start to vary and snakes slither along the logs and pavement.

The game, of course, has some basis in fact. Ecologically-minded people in Norfolk have formed toad patrols.

SOFTWARE *Shortlist*



Apparently toads need a large flat area when croaking out their mating call and, unfortunately, lots of them choose six-lane motorways with the result that they become road pizzas. The well-meaning toad-lovers carry them singing off the motorway in sacks. I bet the toads are pretty confused.

As far as the frogs go, the love interest is faithfully reproduced. While crossing the river, you can score extra points by hopping on to a pink lady frog and escorting her home. Should there be a fly in your home bay when you hop into it, this will also score extra points.

This is one of the few frogger games that has managed to hold my interest for more than a few minutes — it is well-designed and enjoyable to play.

Q-bert

- *Atari*
- *Parker*
- *£34.95*

★★★★

THE ONE, THE only, the original Q-bert — or at any rate the one under license from Mylstar Electronics Inc this game for MC Escher freaks shows a screen display illustrating a pyramidal assembly of cubes like a pile of playbricks. Your goal is to score as many as possible by changing the colour of the cubes on the pyramid from a starting colour to a destination colour. You do this by hoping the ovoid Q-bert from block to block. The idea is to change the whole pyramid to the colour shown at the left of the screen.

He has to avoid hopping off the sides or the bottom of the pyramid or else he is lost. Meanwhile, keep a weather eye out for Red Balls who is liable to squash Q-bert and Purple Ball, who does the same plus hatching Coily the Snake at the bottom of the pyramid.

In a real emergency Q-bert can can hop onto a flying disc, the number and position of which differs according to the level of play. Other characters include Ugg who travels sideways and up and jumps on people, Slick who confuses the issue by re-changing the colours of the cubes, and finally Green Ball. If Q-



bert can catch Green Ball he freezes all the other characters, scoring extra points. The round ends when the pyramid has changed colour completely.

If you have any lives left, you progress to the next round — and the game speeds up. What makes this game is the element of planning of strategy. You can't really just hop around and hope to achieve something worthwhile. For a start, after level 2 you dont just change the cubes from their start colour to their final colour. There is an intermediate colour stage to go through as well. After this the sequence of changes becomes even more complex. There are nine levels of play. The graphics are clear and well-designed, not without a certain humourous appeal.

For example when Q-bert is struck down by the cruel twists of fate, not to mention the purple balls he utters, in the form of a speech balloon, that primal scream which can only be represented by squiggle exclamation mark hash sign question mark squiggle. Whatever this word is, I have yet to hear it on Channel Four.

Pedro

- *Dragon 32*
- *£5.50*
- *Imagine*

★★★

ALSO AVAILABLE for the Spectrum, this program as implemented on the Dragon creates a most impressive screen display, reminiscent of the three dimensional maze game Ant-escher — only you cannot move any deeper into the maze than is already shown on the screen.

Pedro is a gardener South of the Border — the herbaceous border, presumably — but his garden is a great attraction for all the local life-forms.

To deter creatures from eating his

(continued on page 59)

Star★chart

Staircase Stampede

BBC B:
Novelty:
£5.95:
Comsoft:



A very fast Q-bert game. There is a veritable outbreak of these on all machines at the moment and there is not much more to be said about this one. It is colourful, gripping and grows in complexity and speed as the game progresses.

Gun Fight

Unexpanded Vic-20:
Shoot-'em-up:
£6.95:
Sumlock:



The sort of game that gives hi-res graphics a misleading name. Nevertheless plenty of fun to be had as you steer your gunfighter around the screen trying to take out the opposing son of a gun who appears to have about as much sense of direction as a decapitated chicken. It is obviously your duty to the public to shoot him since he is wheeling around the desert obviously the worse for tequila.

Microbot

Spectrum:
Shoot-'em-up/maze:
£5.95:
Softek:



You are a disgruntled droid who would rather have been a truck driver than a brain surgeon: debugging the large positronic brains of the new batch of QT robots is very risky. Left screen displays a map showing the 12 sectors of the robot brain. Below this are readouts showing damage status and power level. You destroy blue bugs with blue fix-a-tive balls, and yellow ones with yellow ones. You also can drive them away for a bit with repulsa blobs. Colourful with good graphics.

(continued from page 57)

herbs Pedro must collect bricks or compost from the bottom corners of the screen and block the maze exits.

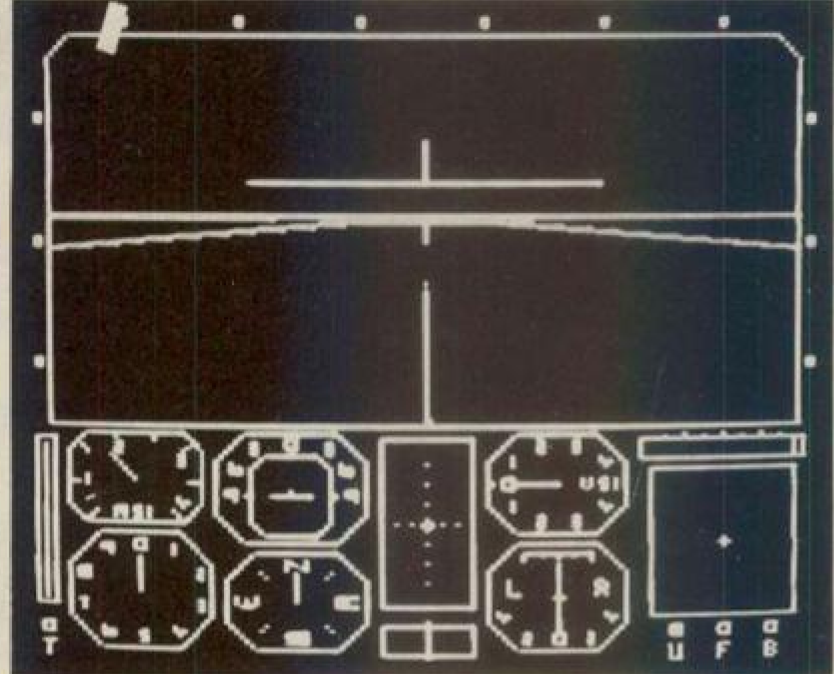
The game is joystick-compatible, but the keyboard arrangement is reasonably sensible. Any key on the top row or the space bar will enable you to jump on the marauding pests — Pedro must have big boots because he seems to be able to jump on ants or elks with impunity. Should you be standing close to heaps of bricks or compost, or the seedbox, pressing these buttons will enable you to pick them up.

The keys to move left are all on the bottom row, beginning with Z and alternating. The remaining keys enable you to move right. To go up any of the keys on the third row up may be used, to move down any of the keys on the second row up may be used. At the end of each level a bonus is calculated.



If any of Pedro's prize blooms fall victim to the local fauna, he has to plant new seeds. This task is aggravated by a tramp who wonders on and tries to steal the seeds. This unsavoury character appears on the screen at random intervals, homing straight in on the seed-box. He is quite easily frightened away, so you do not have to trample on the tramp.

So a thing still most rare in Dragon software; amusing colourful graphics and an absorbing and taxing game.



Sea Wolf

- *Sinclair ZX-81*
- *£5.95*
- *Stephen Hartley Software*

★ ★ ★

Given the limitations of the machine, an excellent litle submarine shoot-'em-up. Two screen displays: periscope display, accessed by pressing P, shows you the familiar endless borderline between sea and sky. Over the horizon lurk the hostile ships of the enemy.

To torpedo a target you must find the ship in the periscope and turn the submarine until its heading is identical with the bearing on top of the periscope display.

On the left hand side of the screen throughout are displayed heading, depth, speed, and whether or not the snorkel is open or closed. Power being used and air left are also indicated. You can recharge your air supply in the time-honoured way by surfacing and using your snorkel. When you fire two white squares shoot off toward the somewhat crude representation of a surface vessel, which explodes and disappears.

The real expertise in this game seems to be figuring out the heading on which you must travel from the radar display. The heading can also be changed by turning the rudder — press keys 8 or 5. The longer either key is held down the more the rudder turns.

This kind of simulation of the inertia of a large submarine vessel is a nice touch in a game implemented on what, with the best will in the world, must be described as a primitive machine.

Forty Niner

- *Sinclair ZX-81*
- *Software Farm*
- *£5.95*

★ ★ ★ ★

A game similar in format to Dig-Dug, but for the black-and-white ZX-81, which can justifiably claim to have hi-res graphics and quite interesting, nay, recognisable ones at that. At least once you've read the useful cassette inlay which has a diagram numbering the 11 different features of this games program, you'll be able to recognise the players in this tense underground tragedy.

Aviator

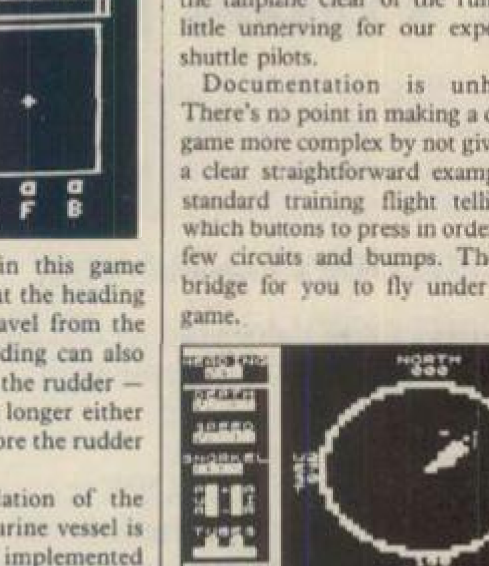
- *BBC Model B*
- *£14.95*
- *Acornsoft*

★ ★ ★

Off we go into the wild blue yonder, or rather, in this case, the wild black yonder. Yes, it's one of those games where they have apparently sacrificed colour for hi-res graphics. The difficulty with flying around a load of white lines on a black screen is that you are apt to forget where you are and fly straight into the perimeter track thinking it to be the horizon. Of course this would not happen if you were sensible and took a close look at your instruments.

There are instruments galore in this program — Acornsoft have made much capital out of getting a real Battle of Britain ace to promote the game. The aircraft simulated is a Spitfire II — and, given the lack of colour, there are some very nice touches like the way your nose pitches down once the airspeed has built up enough to lift the tailplane clear of the runway. A little unnerving for our experienced shuttle pilots.

Documentation is unhelpful. There's no point in making a complex game more complex by not giving you a clear straightforward example of a standard training flight telling you which buttons to press in order to do a few circuits and bumps. There is a bridge for you to fly under in this game.





The great American Gold Rush started in 1849 when everybody rushed to the West Coast to look for gold, according to Software Farm. None of these people can have got very rich because the big '49 gold strike was up north in the Klondike. Still historical accuracy is not at issue here because giant rats and vicious gremlins have never been regarded as common hazards to gold miners, either.

YES!

"On-board" microprocessor.

Electro magnet to pull motor spindle onto tape.

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PHLOOPY 100k cartridge, shown not yet pushed fully home.

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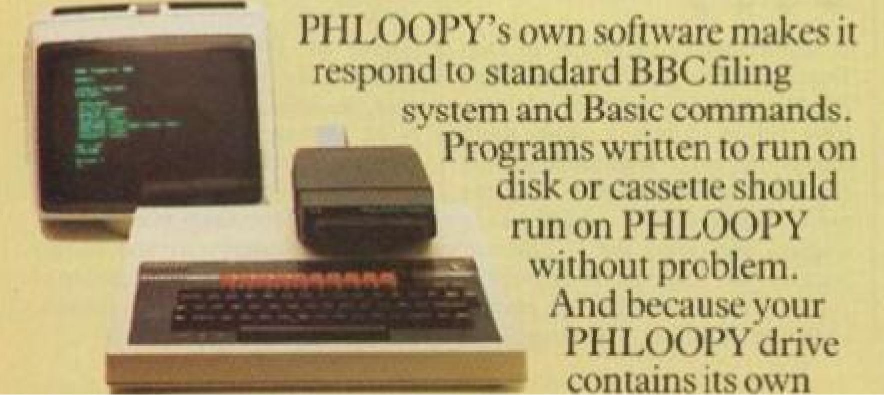
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YC

QUEST Corner

NEWS

o a e o
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h h

The crystal ball

Help is at hand for those thousands of adventurers who have not yet managed to complete The Hobbit. Shining brightly amidst my newly delivered batch of spell volumes is a splendid new tome from Melbourne House entitled "A Guide To Playing The Hobbit". Priced at £3.95, the book gives vital guidance on strategy and tactics together with essential information to help in solving all the Hobbit's dark secrets. A sorely needed book and an absolute must for every owner of this very successful adventure.

An itch in my palm tells me to expect a new adventure from Shards Software, a "pre-quel" to the unusual Pettigrew's Diary and possibly to be called Operation Sasfras.

My raven reports that Phipps Associates have released a new text and graphics adventure for the Spectrum — Colditz is its name.

The tea leaves distinctly indicate that a text and graphics blockbuster for the Commodore 64 is about to be released from Prolific English Software. Watch this space.

A helping hand

One of my favourite brain-bogglers is Acornsoft's Philosopher's Quest for the BBC Model B. It is choc-a-bloc with cunning puzzles and sadistic surprises. Perhaps you are having trouble getting past the Portcullis then into and out of the danger room. If so, here's the way to get in:

HTRON PMUJ NEHT
TELUMA BUR

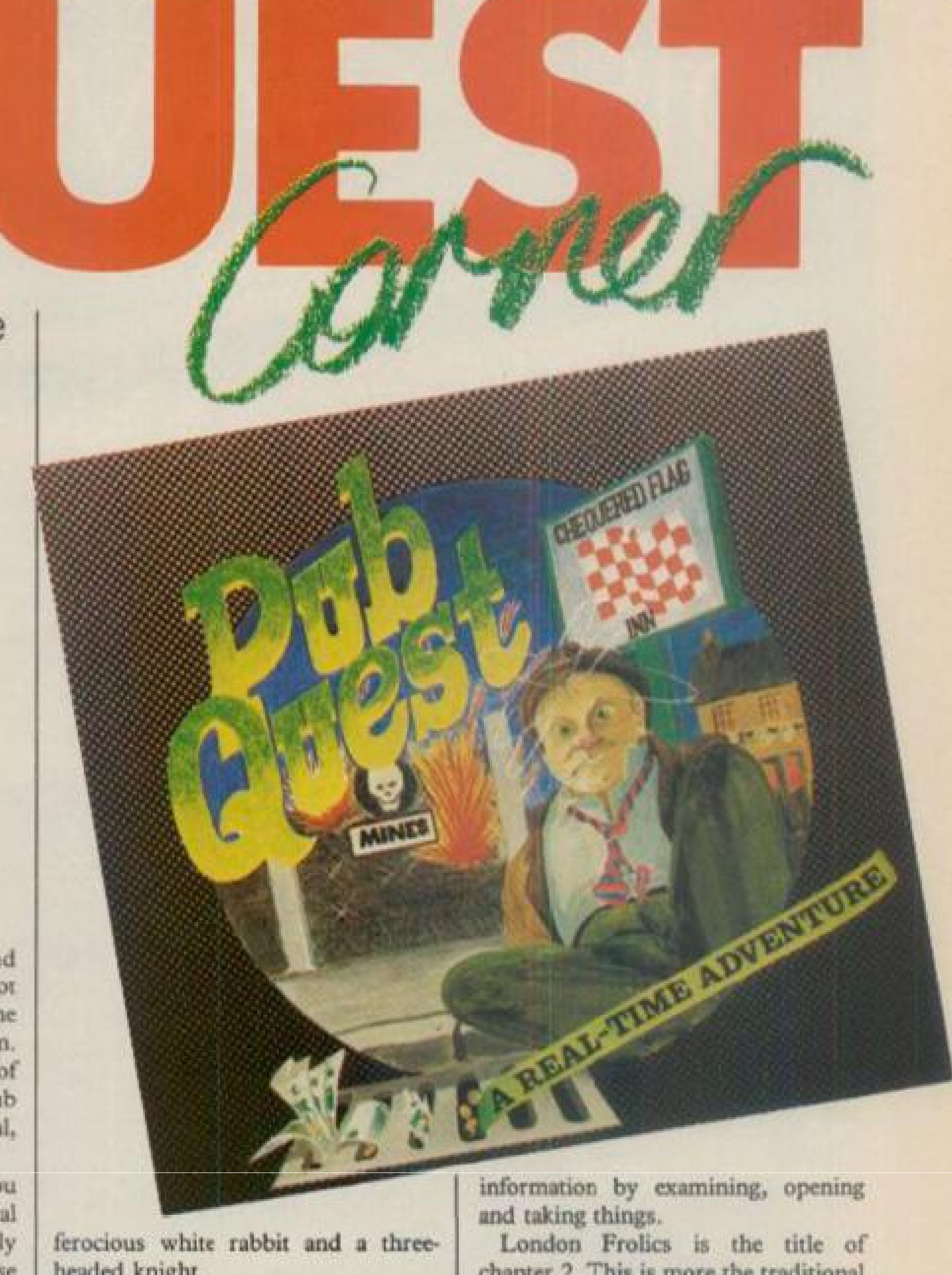
And the way to get out again:

HTUOS NUR DNA
KSAMSAG TEG

Stymied by a serpent on a box in Phipps mind-stretching Knight's Quest?

EPOR A OTNI SNRUT TI
EKANS ELGNARTS

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.



Pub Quest

Commodore 64
£5.95
Dream Software

THERE ARE MANY underground settings for adventures but I do not think I have yet seen one where some of the action is set in a sewer system. It would be a pity if that sort of environment puts you off since Pub Quest turns out to be an unusual, testing and quite funny adventure.

To pay off the massive debt you have managed to build up at the local hostelry, you must somehow quickly accumulate some money. You realise that there is likely to be quite a bit of cash down the nearby drain since most of it was originally dropped there by you while inebriated.

Your journey starts by the main street outside the pub. Cross the busy road at the wrong place and you will find your body covered in tyre marks — end of mission! The Pelican crossing is none too reliable, either. You may well find yourself up a tree — getting down is another matter.

The game has quite a few tricks and surprises in store. Although there are one or two spelling mistakes, in general it is an enjoyable and engrossing program.

If you are feeling a bit jaded, this is an adventure to liven up your liver and tickle your funnybone.

Quest for the Holy Grail

48K Spectrum
£5.95
Dream Software

IF YOU HAVE seen the Monty Python film of the same name, you will have an idea of what this adventure is about. Included in the plot are such creations as the Knights that go "Nic!" — always on the lookout for a nice shrubbery; an extremely unpleasantly behaved French Guard; a ferocious white rabbit and a three-headed knight.

The adventure offers both text and graphics, the latter being fairly simple pictures of each location. There are plenty of locations but not very many objects or characters. The "Save/Load Game" feature is very fast, making it little bother to save a position at any perilous point.

The quest is rather easy to complete and as such is more suitable for the novice adventurer.

Pettigrew's Diary

BBC B/Dragon
£9.95
Shards Software

BBC MODEL B owners may now give three cheers — one of the most original adventures on the market, Pettigrew's Diary, is now available for their machine.

On the cassette are three separate programs, each one a sequential chapter linked by the mysterious diary. Successfully completing one of them provides you with a password into the next — without the vital word you cannot progress further. Some pretty good theme music introduces each section of the adventure.

Chapter 1 is mainly graphic. You are inside a burning farm house where you move around and try to collect information by examining, opening and taking things.

London Frolics is the title of chapter 2. This is more the traditional text adventure, except that the action takes place in real time and the text is delivered in teletype style. Here you wander around London, visiting interesting people and places in your search for more information. Beware — some characters may not be what they seem to be . . .

Chapter 3, European Trek, is a series of eight different challenges on a range of abilities. These include getting Pierre down from the Eiffel Tower and discovering who the best German barber is.

Completely original and highly intriguing, Pettigrew's Diary will give your grey matter a thorough work-out.

June 13th
At last the mysteries seem to be unfolding before me. Very soon, I sense, the ultimate secret will be mine. But also, I can sense the evil forces closing in. Every day they seem stranger. It is my duty, then, to maintain this journal of events, so that it may guide he who may follow, if anything should happen.....





DISK GAMES FOR THE COMMODORE 64

If you've got a 1541, you don't want to spend ages waiting for cassette games to load. Freed from the restraints of loading times, Audiogenic Disk Games can give you typically around 30K of machine code! More code means better games, better graphics and sound, more variation, and those little extra touches that you will come to expect from a game. Here are our first great releases!

FORBIDDEN FOREST

Forbidden Forest is more of a quest than just a game! The action takes place in a four dimensional scrolling forest landscape which many have entered, but none has returned. Yes, I did say FOUR dimensional - day fades into night as the action unfolds! The quest is to seek out and destroy the Demogorgon, mystic ruler of the Forbidden Forest. Before you can even set eyes on him you will have to contend with his army of fearsome creatures, including mutant spiders, showers of giant frogs, snakes, dragons, skeleton soldiers and more! You have only your trusty bow and arrows to depend on!



*





AZTEC CHALLENGE

A challenge on an epic scale! Aztec Challenge takes you on a journey to Mexico and the ancient pyramid of Tenochtitlan. The ancient Aztec gods and their devotees have ensured that no ordinary human can learn the secrets of the temple and live to tell the tale. The pyramid is protected by all manner of treacherous traps and hidden perils - an epic test of your courage and cunning. Aztec Challenge features no less than seven totally different screens - here are just three of them - each of which presents a brand new challenge. We hope your joystick can stand up to it!

*

SLINKY

Slinky, the spring, was having fun hopping about when suddenly he came upon a pile of coloured blocks, so he thought he'd play around on them for a while. Much to his amazement he found that they changed colour when he landed on them. Wow! But unknown to him, the blocks belonged to the Wicked Wizard, who sent his friends along to tease our poor hero. Slinky is a real fun package with ninety-nine levels, amazing reward displays, and action replays. Where else could you meet such charming characters as Dusty the dust cloud, Marge the magnet, Ralph the random raindrop, and Lorenzo the chameleon hopper?



*

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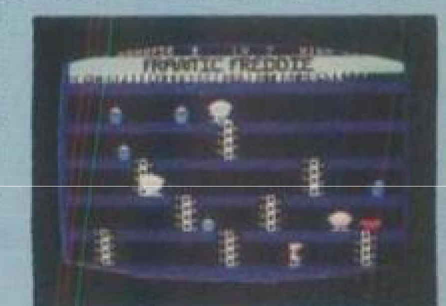
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FRANTIC FREDDIE

Frantic Freddie is fun all the way! Played to an unbelievable soundtrack of brilliantly arranged tunes, Frantic Freddie contains all the ingredients that make a game into a classic! Freddie is a telephone line engineer who has to climb up and down the telegraph poles, picking up pots of gold and avoiding the dreaded Greeblies. The Greeblies take on a different form with every new screeen, but one thing's for sure - they may look cute, but they show no mercy! Frantic Freddie also features wacky messages, funny interludes and silly bonuses. Frantic Freddie - a game with a sense of humour!

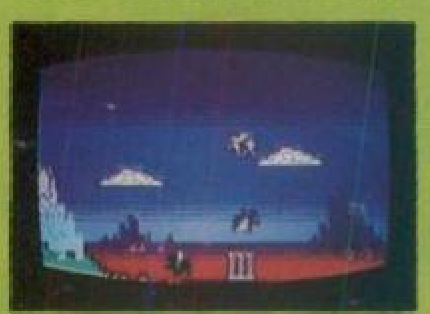


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PEGASIS

Pegasis takes us back to the mythical age when the battle between Good and Evil was fought by heroes on winged steeds. As the champion of the forces of Good, you must topple the evil Black Warriors from their jet black flying horses by swooping down on them from above, then land and finish them off before they can remount. In order to keep airborne, you must keep your wings flapping with the joystick Fire button, and control direction with the stick. The brilliant programming of Pegasis gives you stunning graphics, bonus creatures, great wing flapping sound effects, an incredible simulation of flying horse aerodynamics, plus - two players can play at the same time!



*THESE FUN-PACKED PROGRAMS ARE ALSO AVAILABLE ON CASSETTE - £8.95

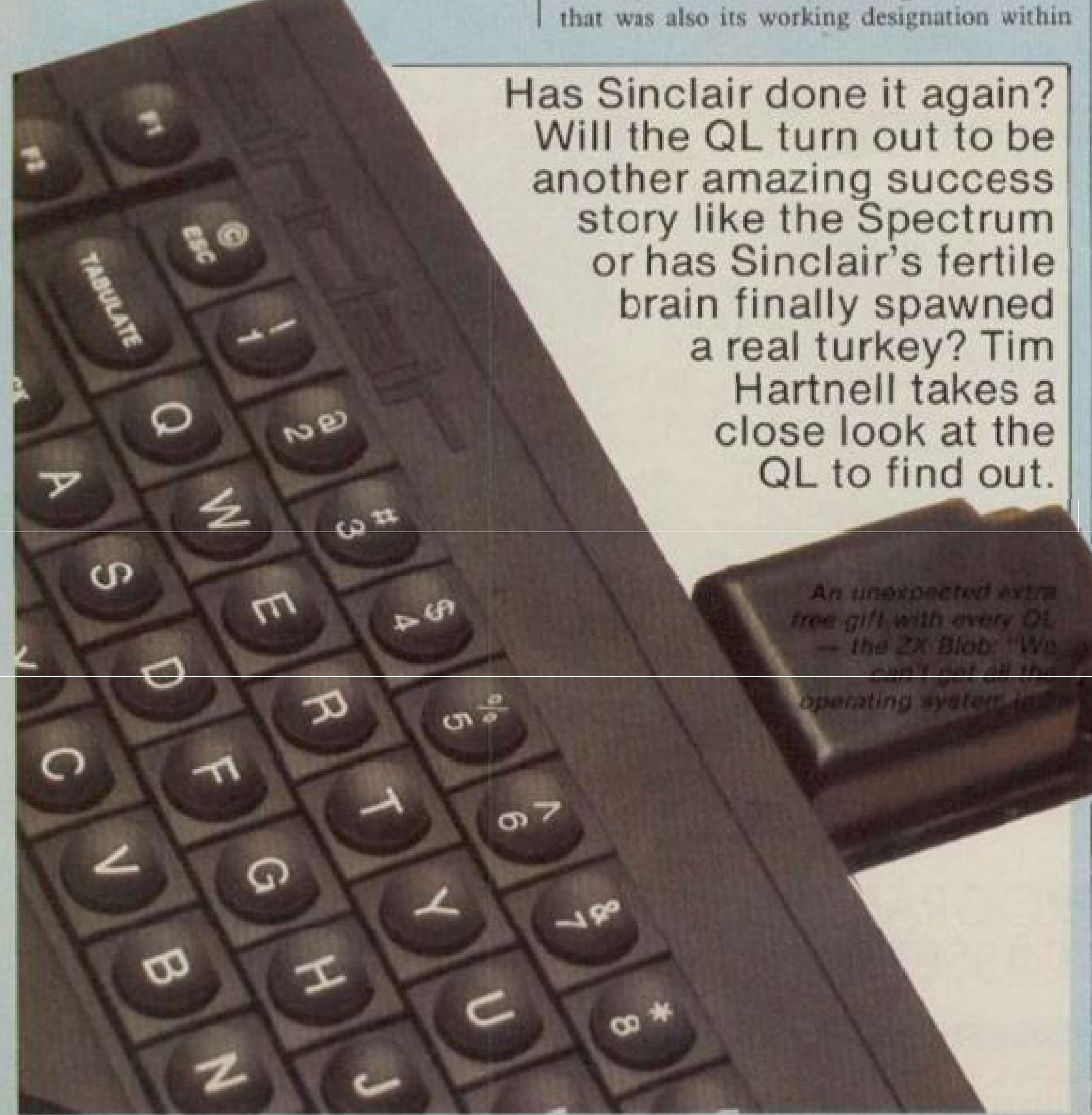
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QL'S DARK SECRETS



Has Sinclair done it again? Will the QL turn out to be another amazing success story like the Spectrum or has Sinclair's fertile brain finally spawned a real turkey? Tim Hartnell takes a close look at the QL to find out.

An unexpected extra free gift with every QL — the ZX Blob: "We can't get all the operating system

SINCLAIR'S QL RAISES a number of questions. Why was it announced so prematurely? Is it worth £399? Is the "free" software of any real value? And so on. The 128K QL has been surrounded by misinformation since the beginning. And Uncle Clive — no stranger to criticism — has come in for more than his usual share during the first four months of this year since the announcement of the machine in January.

In this review, I will attempt to provide answers to some of the questions I've raised. Most computer reviews concentrate on the machinery, the hardware, and leave the ideas which lie behind the machine, the concepts the designers tried to embody in it, for other, later commentators to examine. But the *concept* of the QL, and the ideas which lie behind its resident language SuperBasic are fundamental to understanding the machine, so they must be discussed, along with the hardware.

Strange rumours

"Those who operate at the cutting edge of technology shall be sacrificed upon it," observed Adam Osborne, and Clive and his staff have been proving the truth of that pronouncement since QL launch day — extraordinary delays in delivery; strange rumours that, perhaps, the machine might never even appear — the QL attracted a lot of flak. I was amused to see that internal Sinclair documents on the QL referred to it as the ZX-83. We all thought of the Spectrum, before its launch, as the ZX-82, and I guess now that that was also its working designation within Sinclair Research. As a way of compensating for delivery delays, and lost interest on money forwarded for the computers, Sinclair are sending out the RS-232 lead — normally £14.95 — as a "free gift" with all QLs which have taken longer than 28 days to deliver. This will happen even if your QL was ordered via credit card, and the amount was not deducted from your card until the computer was sent out. If you had, in fact, ordered the RS-232 lead, Sinclair will send you £14.95 back.

One of the reasons for the delivery delays will be evident if you get one of the first several thousand machines sent out. The QL does not fit within its natty dark-grey case. "We can't get all of the operating system in," a spokesman confided. So sticking out of the ROM socket at the back of the QL is a blob of metal, slightly larger than a matchbox, which contains the bits of the computer which Sinclair could not squeeze into the case.

Eventually, QLs will be going out without the extra blob at the back, but Sinclair felt it was more important to quiet the clamour over protracted delivery delays — even if it meant sending out cobbled together machines — than it was to delay the whole thing until they got it right.

Sinclair Research intimated — without ever saying it straight out — that if the QL without compulsory blob of metal is significantly better than the first edition deliveries, there would be some facility for exchange. No hints as to how this would occur were volunteered.

It seems that the QLs shown at the tumultuous press conference in January did not contain all of the computer. It has been no particular secret within the industry that Psion — the company which developed the four software packs supplied "free" with the QL — did not have access to anything like the final version of QDOS when they were writing the programs. QDOS is the QL Operating System, which looks after such things as task scheduling and resource allocation. And if conversations taking place while I was at Sinclair Research in late April were any indication, it seems that QDOS was far from being finalised even then, only 10 days before the first machines on the greatly delayed delivery schedule were due to go out.

For example, Nigel Searle, managing director of Sinclair Research, told me they were thinking of radically changing the way the Microdrives accessed programs. At present, the QL finds the first block of data which makes up the program, then keeps the tape spinning until it comes to block two, then once it has digested that, looks for block three, and so on. The modification would allow the computer to accept the blocks out of order, thus greatly minimising the time it takes a program to load.

I timed the loading of Quill, the word-processing program provided with the computer, and found it took 70 seconds from the time loading began until the program was ready to use. This may not seem very long if you're used to cassettes, but it is an age compared to discs.

There are now three different editions of the Spectrum around. It seems obvious that



Figure 1.

Inbuilt Procedures
ARC
ELLIPSE
LINE
POINT
SCALE
BEEP
INPUT
PAUSE
PRINT
BAUD
CLOSE
COPY
COPY_N
DELETE
DIR
FORMAT
OPEN
OPEN_IN
OPEN_NEW
POKE
POKE_W
POKE_L
RANDOMISE
CLEAR
CONTINUE
EXEC
EXEC_W
LBYTES
LIST
LOAD
LRUN
MERGE
MRUN
NEW
RETRY
RUN
SAVE
SBYTES
SEXEC
STOP
AT
BLOCK
BORDER
CLS
CSIZE
CURSOR
FLASH
INK
OVER
PAN
PAPER
RECOL
SCROLL
STRIP
UNDER
WINDOW

Inbuilt Functions
BEEPING
INKEY$
KEYROW
ABS
ACOS
ACOT
ASIN
ATAN
COS
COT
EXP
INT
LN
LOG10
SIN
SQRT
TAN
PI
CHR$
CODE
PEEK
PEEK_W
PEEK_L
RND

Commands
FOR
REPeat
SELect ON
IF THEN ELSE
DEFine
PROCedure
RETURN
DATA
END FOR
END IF
END REPeat
END DEFine
END SELect
EXIT
NEXT

there will be at least two editions of the QL. There may well be more than two of the software packs. I found two spelling errors in the help menu for Quill when I was reviewing the software — although I knew, and it is only fair to point it out, that I was only using a late development version of the software, rather than the final version — and was given the impression that correcting these errors would be incredibly easy. This was, as I've said, just 10 days before the first product was due to leave the warehouse.

Now that we have looked at the fun and games concerning the first QLs which will be released to the market, let's see what sort of a computer it *really* is. Many early "reviews" of the machine were based on the press release, plus two minutes "hands on" at the press conference. I spent many, many hours with a QL trying to assess it completely.

Wet towel test

You know what the QL looks like. The photographs with this review show you the by-now-familiar long, blackish case, with the Microdrives occupying the right-hand six inches, and the rest of the 19-inch length being occupied by the keyboard. The machine is light, but does not appear particularly fragile.

I tried to "wring" the computer — as one would a wet towel — and there was very little give, and no ominous cracking sounds. The horror of losing the 16K RAM pack off the back of the ZX-81 — which meant you treated the machine with great care — does not seem necessary with the QL. Even shaking it fairly violently failed to dislodge the ROM pack, or to disturb the image on the TV screen.

Sinclair keyboards were one of the main sources of complaint on earlier machines. You use the keyboard nearly all the time when interacting with the computer, and any design failure at this point becomes a constant irritation. The QL is about 1½ inches thick, which means when it is lying flat on the table, the keyboard is not particularly easy to use.

However, the machine is supplied with three little plastic square feet which stick on the bottom of the QL and allow it to be tilted forward, to an angle which I found extremely convenient.

The keyboard itself was a surprise, and a very pleasant one. As I spend a lot of my waking hours working with keyboards — generally word-processing on an IBM PC, or writing with an electric typewriter — I am accustomed to keyboards which work *with*, rather than against, me. I have become boringly impatient with crummy keyboards, or with design faults which mean the keyboard cannot keep up with me when I type quickly. The QL is surprisingly satisfactory to use.

The keys are made up of separate keytops, sitting on a membrane keypad below. The membrane construction is not evident from using the keys. Although there is a slight need to press the keytops down rather than just tap them as would be the case with an electric typewriter, only the slightest push is needed to get them to work. The keytops are moulded, so that fast, accurate program entry is easy.

RAM wipeout

The keys auto-repeat after about a third of a second. The space-bar rattles a bit, but this is not particularly important. The Enter key is a large, L-shaped key on the left, there are two Shift keys, and Escape is up near the top right-hand corner of the keyboard. A Reset key is hidden down the side, next to the Microdrives. It is easy to press without looking for it, but is unlikely to be pressed by accident which is just as well, as it performs a total RAM wipeout.

My only criticism of the keyboard lies in the position of the cursor keys. To the left of the

(continued on next page)

(continued from previous page)

space-bar are the left and right arrows, while the up and down arrow keys are to the right of the bar. I'm sure you will get used to them in that position, but I found their initial use far from intuitive.

No such criticism can be aimed at the position of the five function keys, which form a straight line down the left-hand edge of the keyboard. They are easy to use in this position and are used frequently in the four software packs such as function key 4 being used in Quill to change the typeface.

Sinclair has abandoned the single-touch key-word entry system which, to date, has been a hallmark of his designs. You type the relevant word in full. You can do this in upper, or lower case, and the computer will automatically render the word upper case in the listing. I'll have more to say about this in a moment, but for now, let's turn the machine on, and see what you'll experience when you first plug it in.

There is no on/off switch. The QL comes with an external power supply, slightly taller than that provided with the Spectrum, with the power supply unit sitting in about the middle of this lead. When you turn the power on, the screen fills very briefly with parallel vertical green and red strips, then this is replaced with hi-res rubbish while the QL does a little internal checking. The screen clears to black, and then the following message appears at the bottom of the screen:

F1...monitor

F2...TV

© 1983 Sinclair Research.

The reference to F1 and F2 is printed in red on a white oblong, surrounded by a green border, while the copyright message is in white on a long, red strip. If you press function key 1 to indicate you have a monitor connected to the socket marked RGB, the screen clears to show a rectangular area which fills about two-thirds of the screen.

The left half of this rectangle is white, the right half is red. If you press function key 2 — to tell the QL you have a TV attached to the UHF socket — the screen clears completely to white.

The graphics modes

There are two graphics modes, Mode 256 which is the lowest resolution mode with, as expected, 256 pixels across and Mode 512, which is double the 256 resolution. The QL falls into 256 if you press TV — with a square, purple, flashing cursor — and into 512 if you press for the monitor — with a thin rectangular cursor, flashing red. You can display eight colours — blue, red, magenta, green, cyan, yellow, white and black — on the 256 by 256 screen, while only four are available — black, red, green and white — in the 512 by 256 mode.

Many other colours can be created using the various stipple combinations. There are four stipple patterns — vertical bars, horizontal bars, big foreground dots, small foreground dots — which allow an enormous range of colours to be created. I worked out a program which combined use of the Contrast, Foreground and Stipple commands, which appeared to generate 255 different coloured screens.

Back with our opening frame when you first turn the QL on. If you work with a monitor, or with the QL sending out the monitor hi-res signal, there is a real delight awaiting you when you enter your first program. As you type on the keys, the program you are entering appears in green on the black area below the white half of the coloured rectangle. But each time you press Enter, the program line reappears in red, on the white above you.

There is room for four lines of program below the white area. Once these four are filled, the top one scrolls up under the white area, and vanishes. Similarly, commands like



Enter the real Sinclair keyboard.

Run stay in place in the black area, even after they have been executed.

Now, when you enter the program, it appears line by line in red on the white square above you. If you decide to enter a new line with the same line number as one already in place, the new line automatically takes the place of the original line, in position within the program automatically.

The real magic is to come. Remember, you are in the high-resolution mode, with half the rectangle in white — with the program printed on it in red — and the other half of the rectangle in red. Type in Run, and the program runs on the right-hand side of the screen, appearing — unless other colours are specified — in white on the red background. Your program listing stays in place. So you can see the listing on one side, and the effect of running that listing on the other side, at the same time.

If you are in Mode 256, when the screen clears to a white rectangle, the program listing appears in red on the white as before but with each character stretched twice as wide as in the higher-resolution mode.

However, when you enter Run and press Enter, the program starts running at the top of the white area, overwriting the program listing, and printing in white on little red squares of "paper" as it goes. The screen does not clear, unless you have CLS within your program. If you do include CLS, the screen will clear — unless you specify another Paper colour, just like the Spectrum — to red, and the Ink defaults to white.

A clue to one of the features of SuperBasic is given if you examine the program listing carefully. Certain programming words are spelt in full within the listing, even if you only entered them as three letters. For example, if you include REM in your program, the QL will change it in the listing which appears at the top of the screen as REMark. This happens with many other commands, such as DIMension and DEFine PROCedure.

This leads neatly into a discussion of SuperBasic, the language supplied with the QL. The production models will have, as an extra added since the launch of the computer, what was described to me as turtle graphics, but no clues were given as how to access or implement these graphics.

Turtle graphics aside, the main thrust of SuperBasic is to encourage more structured programming than is usually the case with Basic. Although Goto and Gosub are provided in SuperBasic, the manual claims this is only to give some kind of compatibility with existing Basics. "They are not needed," we are told sternly.

The QL can be used more or less like a Spectrum, programming in Spectrum Basic, and getting roughly similar results. But to work in this way ignores the power of SuperBasic. For example, repetition — controlled by either a For/Next loop, or an endless loop which ends with a Goto back to the beginning, in "standard" Basic — can be controlled in SuperBasic by two "constructs" as follows each construct has to be indentified:

```
REPEAT identifier
  statements
END REPEAT identifier
FOR identifier=range
or
statements
END FOR identifier
```

These two sections of code are used together with another two words from SuperBasic's vocabulary.

NEXT *identifier* EXIT *identifier*

Processing a Next statement will either pass control to the statement following the appropriate For or Repeat statement, or if a For range has been exhausted, to the statement following the next. A table outlining the complete SuperBasic vocabulary is given in figure 1.

Tropical environment

After I'd been using the QL for a couple of hours — and I have no way of knowing how many hours it had been in use before I started on it — the plastic area above the Microdrives became very hot indeed. "A slight increase in warmth above the Microdrives is normal, and should not be cause for alarm," the manual reassures. However, the Microdrives continued to work happily, even in their tropical environment.

You will see that colour generated by the QL is crisp and clear on a monitor, and significantly better on a TV than that produced by Spectrum. Even stippled areas and lines did not show the dot crawl which became a trademark of Spectrum graphics. You have much more control of the screen than is the case with the Spectrum.

The QL allows you to specify the colour of the border, and its width. Windows can be created, with Lisa-like things happening apparently independently in different areas of the screen at the same time.

According to the published specifications, I thought the QL would in certain cases run about twice as fast in Basic than does the Spectrum, but it did not seem significantly quicker to me when doing such things as

(continued on page 69)



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(continued from page 66)
running through loops and printing on the screen. I did not, however, have long enough with the QL to write any moving graphics games in Basic to see how such a program compared with its Spectrum counterpart.

The looseleaf manual is an enormous improvement on the manuals provided in the past with Sinclair products, and shows that Sinclair — probably under prompting from Psion — has at last recognised that it is almost impossible to give people too much information about the product they are buying.

The manual is divided into eight major sections — Beginner's Guide, Keywords, Concepts, QL Quill, QL Abacus, QL Archive, QL Easel and QL Information. The sections on Quill, Abacus, Archive and Easel contain comprehensive instructions for running the software.

QL coercion

Reading the manuals shows many areas where the designers of SuperBasic have been very clever. For example, SuperBasic embodies an action called "coercion". If the QL is expecting a string, and you give it a number, it will automatically turn it into a string. Similarly, if you try to add two numbers, and one of them is in the form of a string, it will convert the string to its numerical equivalent — in effect, Val the string — rather than crash with an error message.

This means the QL needs to know when you are dealing with strings, and when you mean numbers, so it uses the plus sign for adding numbers and the ampersand for adding strings. The following are valid in SuperBasic.

LET A = "3" + 4 (sets A equal to 7)
LET A$ = 6 & "32" (sets A$ to "632")

The use of Let, as in nearly every Basic in the world except the first three Sinclair Basics, is optional.

There are a number of other ways the designers of SuperBasic have worked to produce a better language for you. If you ask the QL to print a variable which has not been assigned, it does not respond by crashing or by assigning the value 0 — or the empty string — to this unknown variable. Instead, the QL prints an asterisk as a sign that you have requested an undefined variable. If you fail to specify a Next command, the computer will continue to process quite happily, but will ignore the For which is not followed by a Next.

Those who decried the faint Beep on the Spectrum will be pleased to hear the QL gives out a very healthy tone, much louder than that produced by the BBC Micro. The command Scroll is followed by two numbers. The scrolling can be positive or negative, and single display line — that is, pixel — scrolling is possible.

The QL contains a real-time clock — accessed as Dates — which is set to a random time and date on switch on. Despite the claims of the manual that Dates could be manipulated like any other string in Sinclair Basic the only effect of a slice was to change the time set on the clock, rather than to extract a section of it.

The QL comes with four software packs supplied on Microdrive, a word-processor — Quill; a spread-sheet claculator — Abacus; an intelligent database — Archive and one to produce business graphics such as bar charts — Easel.

I suspect that for many non-business owners of the QL, Quill will be the most popular program of the four. While many of us have little need to draw bar charts of such things as our steadily-increasing personal wealth, all of us tend to write letters, school essays or reports.

When you start with Quill, you have a red frame on the screen, on which you are typing in green. The start of each paragraph is automatically indented, without you doing anything. Above the red frame are printed many operation instructions, such as the one telling you to press function key 4 to change the typeface.

Rapid response

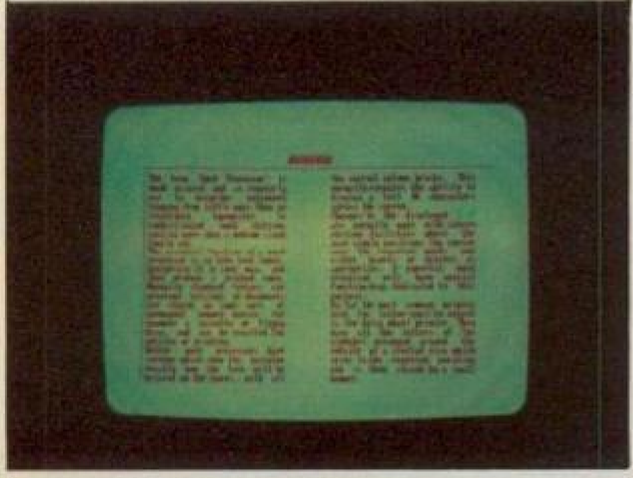
You do not need to worry about a word being split at the end of a line, as the QL automatically starts a new line when needed, and spaces out the words on the line which you've just completed so that the right- and left-hand margins both form straight lines. This happens without you needing to know anything. The system responds rapidly to typing. There is no appreciable delay when typing in on "clean paper".

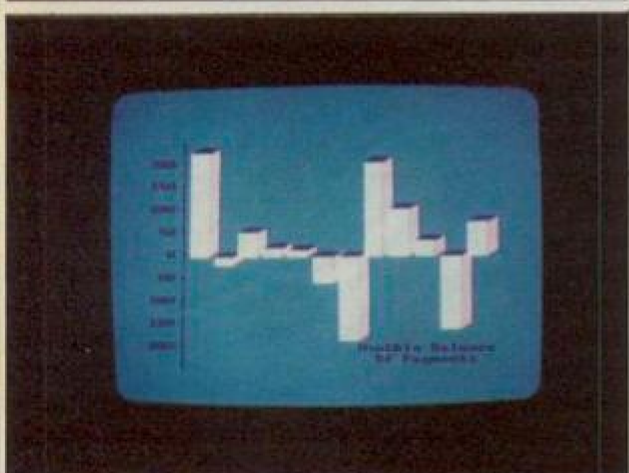
If, however, you wish to overwrite, the system slows down to an annoying extent. Despite this, the program really does live up to its claim that it can be used without reading the manual. Function key 1 is permanently assigned to help, so pressing it leads you into a series of sections designed to get you out of trouble. Once you exit the help mode, you will find yourself exactly where you were before you called for help, so you can continue from that point.

There are five kinds of typeface available with this program — normal; bold; high which produces supercripts; low — subscripts, and underline. They can be mixed, so "bold, underlined, high script" is a valid mixture.

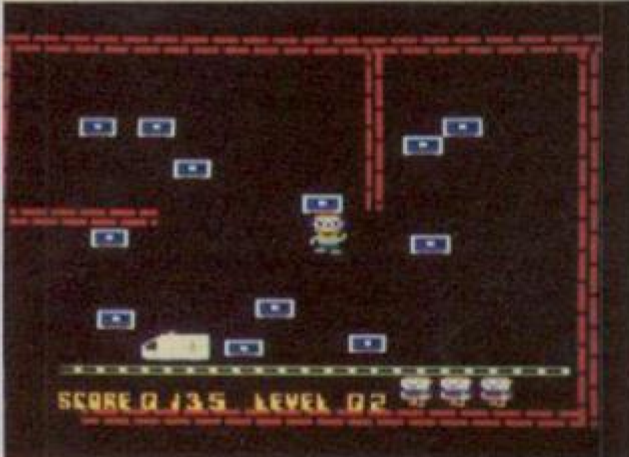
CONCLUSIONS

- You're going to like the QL. As with all Sinclair products, it may display quirks and annoyances which are not immediately obvious, and the slow access times of the Microdrives may annoy you, but overall it is a fascinating package.
- The colours are bright and clear and the multiple-colour, multiple-width border and windows will get a lot of exposure in coming games packages.
- Despite all its flashiness, the QL is an unproven machine. The Microdrives are unproven mass storage devices. I suggest it would be a brave business which would entrust essential data to Microdrives.
- It is hard to imagine it being adopted as a "business machine" by any but the smallest of companies. It makes a great home machine, and there is no doubt that many of the 750,000 Spectrum owners will upgrade.
- There is a slightly tacky feel to the machine, and I would hesitate to recommend it to someone who could be buying a BBC Micro — admittedly without mass storage, and without software packs — for the same price.
- The QL is certain to be a commercial success. Some brilliant software will be written. Lots of people will have lots of fun with the machine ... and yet I sense that the time for foisting unproven products on the market-place has gone.
- The QL may have been announced six months too soon to try and get the BBC to turn their favoured glance away from Acorn. The QL has, predictably, stretched the definition of "28 days" beyond the recognition of mortal men. ■











REVIEW

AMSTRAD

Is Amstrad's CPC-464 a treasure chest or a Pandora's Box? Simon Beesley plugs in and goes.

AMSTRAD MADE ITS mark in the hi-fi market by selling high-specification stereos, which could simply plug in and go, at a low price. Adapting the same formula to the home computer market the company is now offering a complete system for £229.

The Amstrad CPC-464 comes with a built-in cassette recorder and a monochrome monitor. With a colour monitor it will cost £329. These are recommended retail prices. By the time the machine appears in chains like Boots, Rumbelows and Dixons it will probably be selling at around £200 and £300. A disc package will follow in September comprising a three inch disc drive, disc controller, CP/M and Logo, all for £199.

The Amstrad computer is built around a Z-80A processor which runs at 4MHz. On board it carries 64K RAM and 32K ROM. By plugging an expansion board into the disc interface at the back you will be able to add alternative ROM or RAM cartridges, 16K at a time.

Along with the disc interface there is also a stereo jack for sound output, a joystick port and a parallel printer interface. At the side of the unit there is a power switch and volume control for the internal speaker.

The keyboard has 74 keys with a good springy feel to them. It includes a numeric keypad which also doubles up to provide function keys each capable of producing a string of 32 characters.

Amstrad is making the fact that the machine comes as an integrated system a prominent selling point. My own view is that the virtues of this feature have been overstated. After all most users do not find the business of connecting up a cassette recorder and a TV especially cumbersome. And probably most buyers will opt for the cheaper system using a modulator for colour display on a TV while retaining the monochrome monitor for 80-column business software.

Amstrad's designers have taken pains to ensure that the display is rock steady, and even on a colour TV it should be superior to that of the average home micro. The character typeface, incidentally, is an exceptionally clear one which uses two dots to form each vertical stroke.

What does make the built-in cassette recorder a welcome feature is that it should rule out the sort of loading and saving problems that bedevil almost every other micro. As an extra aid to reliable storage there is a choice of two data transmission rates, 1,000 baud and 2,000 baud.

Saving from Basic is also well catered for. As well as saving a program in its normal tokenised form you can also save it as an ASCII file or as a protected file. Once protected it can only be loaded with the Run command which should guarantee security. In addition there is a command to save any block of memory, equivalent to the Spectrum's Save Code or the BBC's *Save.

This spread of commands devoted just to tape storage is indicative of Locomotive Basic's scope. By allowing 16K each for the Basic interpreter and operating system as opposed to the more usual 8K the designers were able to make the ROM software both highly extensive and fast. As far as speed goes it is only a shade slower than the BBC micro.

Unlike the BBC ROMs Amstrad's 32K ROM does not limit the amount of RAM available. The screen memory occupies 16K of the 64K RAM and the operating system takes a further 5K for work space, leaving the user with just over 43K RAM.

People who are used to the idea that 8-bit micro have only 64K to share between ROM and RAM may find this puzzling. The way it works is by switching between ROM and RAM. When, for example, the display controller reads the screen memory in RAM the Z-80 processor goes into a wait state. It then switches to the Basic in ROM which occupies the same top 16K as the screen.

Similarly, the ROM-based operating system and Basic program area occupy the same space at the bottom of memory. The processor copes with this by alternatively turning ROM and RAM on and off.

Locomotive's Basic is a version of Microsoft, greatly enhanced by graphics and sound commands, and a number of other unique features. Thus Locate to position the text cursor and Print Using, which formats print output, are familiar enough; but After and Every are special to the Amstrad.

They give the Basic programmer a chance to use interrupt routines, a feature normally only available from machine code.

The Every command interrupts a program



at regular intervals and directs it to a subroutine.

EVERY 10 GOSUB 200

calls the subroutine at line 200 every 10/50s of a second. The After command does the same thing but only once.

Speed Key and Speed Ink are likewise unusual. The first sets the key repeat period while the second determines the rate at which colours flash. Key Def is another newcomer which redefines the keys so that, for example, you could convert the N key to print the question mark character.

Along with such novelties there is a particularly full set of programming aid commands and debugging features. These include Renumber, Delete, Trace and some extra error-trapping instructions, On Break Gosub and On Break Stop.

To force a break you need to press the escape key twice; pressing it once simply halts the program until you hit the space-bar — another useful feature not commonly found on home micros.

To edit a program you have a choice of using either the standard Microsoft line editor with its Edit command or the copy cursor. The latter is much easier and lets you move to any line and then copy part or all of it down to the bottom of the screen.

On the graphics front the Amstrad is particularly well favoured. There are three modes. Text and graphics can operate together in each of them. Mode 1 is standard and gives 40 columns by 25 rows of text or 320 by 200 pixels with a choice of four colours.

In Mode 2 the resolution drops to 20 by 25 and 160 by 200 but the choice of colours is increased to 16.

Mode 0 provides 80 columns by 25 and a

(continued on next page)





CONCLUSIONS

- ☐A 64K computer complete with cassette recorder and monitor, all for £200, must be considered remarkable value.
- ☐In addition CPC-464 boasts graphics which are superior to those on any other micro in this price range; while its sound facility is matched only by the BBC Micro and the CBM-64.
- ☐Making use of these features is facilitated by an extensive and well thought out Basic.
- ☐The machine seems assured of success and in consequence should receive strong software support. ■

(continued from previous page)

pixel resolution of 640 by 200, in two colours.

It will be seen that the screen modes are similar to the BBC's without the BBC's text-only modes. The similarity also extends to the way the Amstrad allows you to choose on-screen colours from a wide colour pallette.

In all there are 27 colours ranging from blue, mauve, yellow and green to lime, pink, pastel green and bright yellow. The idea is that in each mode there are a limited number of colour pens and these can be assigned any of the colours in the pallette.

Pen is the command which selects the current colour. Thus in Mode 2

PEN 3,10

activates Pen 3 and assigns to it colour 10 which is cyan. Any future text printed will be in cyan. As a further elaboration you can now use the Ink command to assign a different colour from the pallette to colour 10.

INK 10,12

causes colour 10 now to be associated with yellow and means that all text or graphics on screen which is in cyan will be instantly changed to yellow. You can also use Ink to create any combination of flashing colours.

Equivalent to the BBC's VDU 19 but easier to use, the Ink command is a powerful feature. As BBC owners have discovered pallette switching allows you to produce fast animated effects without leaving Basic.

For pixel plotting there are absolute and relative commands to plot points, draw lines and move the cursor — Plot and PlotR, Draw and DrawR, Move and MoveR. Test and TestR report the ink colour of a given pixel, while XPOS and YPOS return the position of the graphics cursor.

Again, as on the BBC, there is also a facility for setting the mode in which a pixel is plotted. By sending a control character before the Ink command you can cause the new colour to be logically Anded, Ored or Exclusive Ored with the old colour. This is highly useful for animation and plotting shapes without obliterating the background, making all sorts of sprite-like effects possible.

For text there is a corresponding option which allows you print in transparent mode. Here the characters are superimposed on the background rather than printed over it.

These commands alone make the Amstrad's graphics superior to those on, say, the Spectrum or the Oric. Unlike these machines you can also create genuine multi-coloured characters since each pixel can be given a separate colour. Add to these features the facility for creating screen windows and you have a micro whose graphics are second only to the BBC's.

Up to eight text windows can be defined. Each is linked to a text stream which makes it easy to print to a specific window. To give an example,

WINDOW #2,0,10,10,0

would set up a square window in the bottom left corner;

PRINT #2

directs text to that window alone. In addition the Origin command sets up a single graphics window as well as fixing the X and Y origins.

The final bonus in the graphics department is the ease with which user-defined characters can be created. Above the normal ASCII codes the character set is filled with pre-defined graphics characters. When the machine is turned on, the dot patterns for the top 16 characters are read into RAM.

These can be redefined by the command Symbol followed by the character code and a list of eight numbers making up the new pattern. In addition you can redefine the rest of the set from codes 32 onwards. You simply enter the Symbol After instruction, which reserves memory for the number of definitions you require.

Sound on the Amstrad is equally impressive. Once again the designers seem to have taken a leaf out of the BBC's book. The AY-3-8912 sound chip produces three voices which can either be output in mono through the internal speaker or sent in stereo to external speaker.

The Sound command can be used to produce a simple sound — either a musical note or white noise — where only the channel, tone, duration and volume are specified. Or it can be linked up with two Envelope commands to create much more complex sounds.

Env, the volume envelope command, allows you to divide a note up into a number of sections. In each you can specify how the volume is to rise or fall.

Ent, the tone envelope command, does the same thing for a note's tone. Between them you can define up to 15 envelopes, synthesising a variety of musical instruments. By setting parameters in the Sound and Release commands you can also arrange that notes on different channels are synchronised.

On top of the features described so far it is likely that the Amstrad has a good deal of untapped potential, particularly for the machine-code programmer. Two such undocumented possibilities mentioned by Roland Perry, one of the designers, are hardware induced sideways scrolling and setting up alternative screen memories.

Locomotive has designed the operating system to be highly accessible to the user. Many of its routines are called via jumpblocks in RAM. This means that they can easily be altered or adapted.

All in all the Amstrad's future looks rosy. Superior graphics and sound, an excellent Basic coupled with a flexible operating system would seem to be winning ingredients. Of course for most buyers a computer is only as good as the software that is available for it. But for a new machine the Amstrad looks likely to be well supported.

Already a number of best-selling titles have been converted, Harrier Attack and Bugaboo among them. The company's target sales figure of 200,000 machines by the end of the year stands a good chance of being realised.



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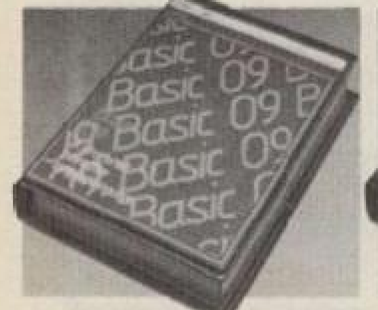
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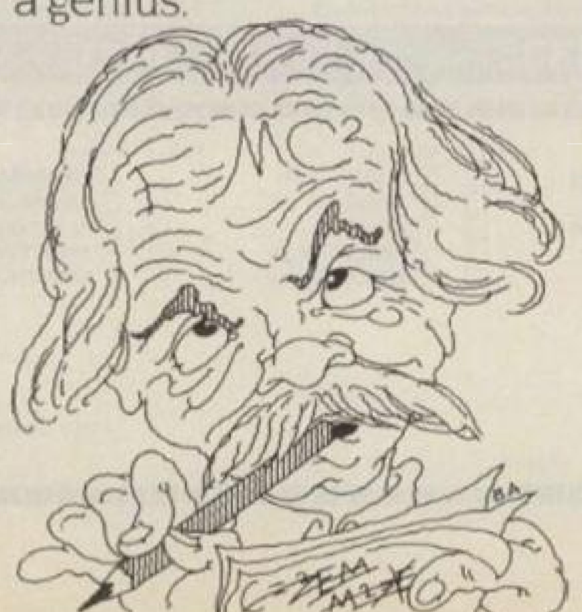
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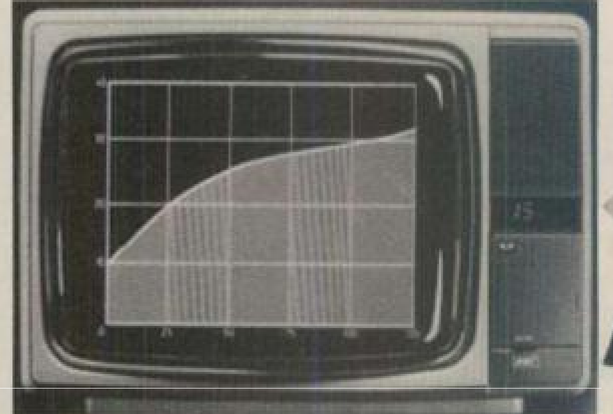


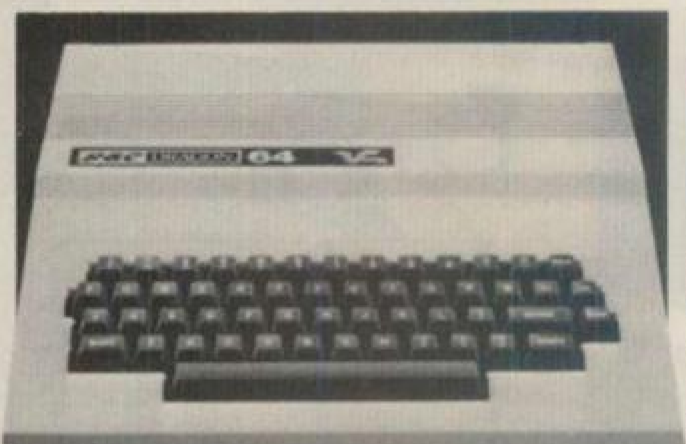
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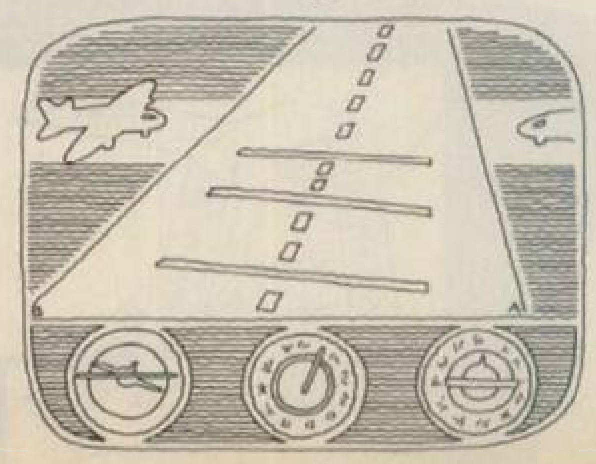






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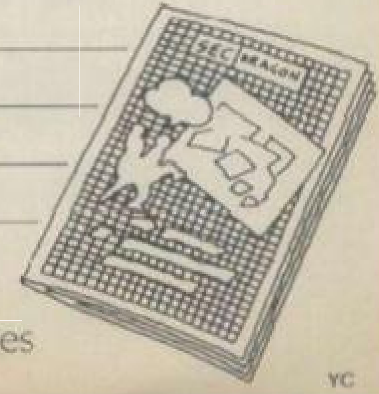
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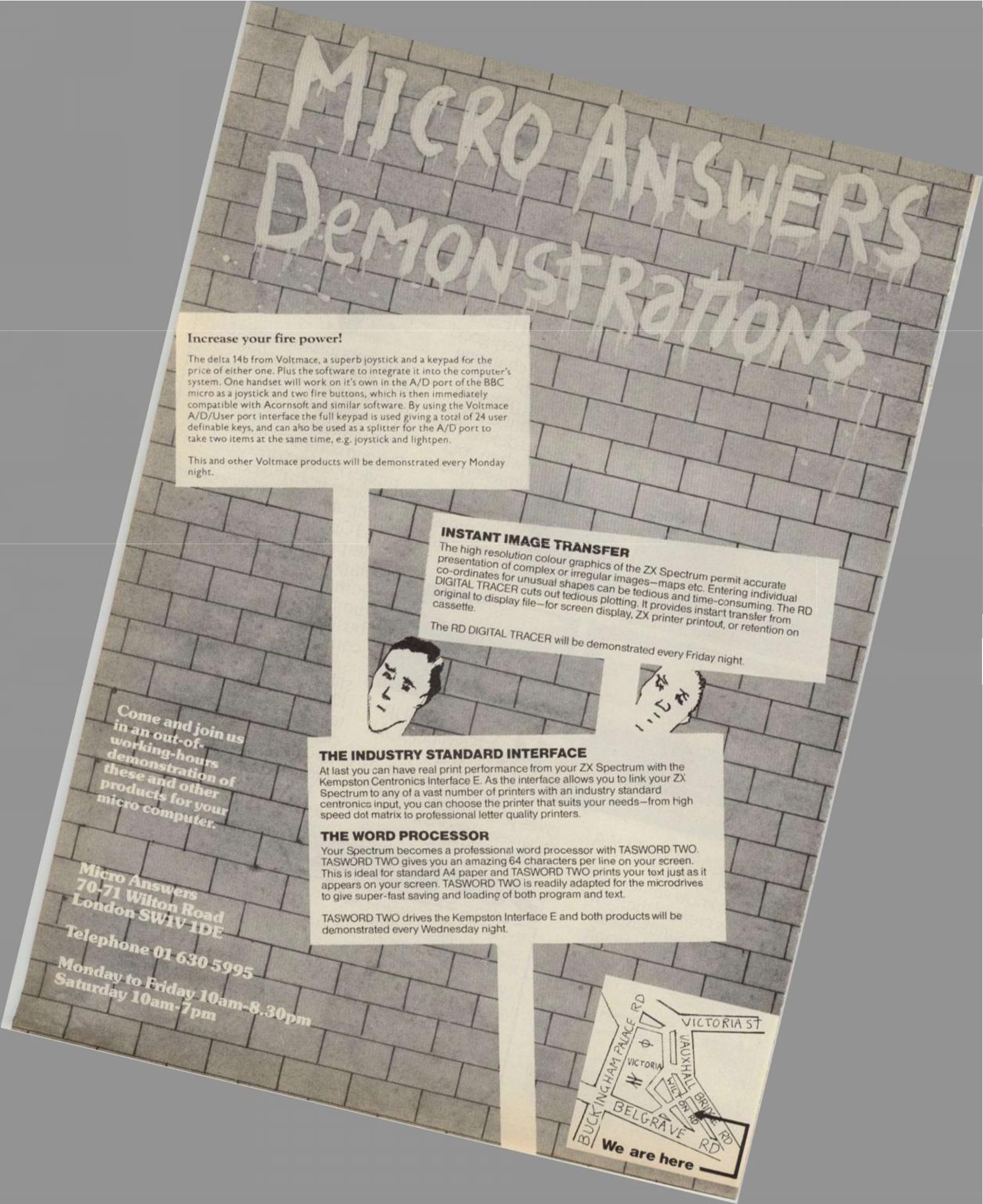
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Monday to Friday 10am-8.30pm
Saturday 10am-7pm
VICTORIA ST
BUCKINGHAM PALACE RD
VICTORIA
VAUXHALL BRIDGE RD
WILTON RD
BELGRAVE RD
We are here

AMSTRAD Competition



Amstrad's new micro comes with screen and tape. So all you need is the software. Amsoft — Amstrad's software house — is giving us two CPC-464s as prizes. Win one in this month's competition.

CPC 464

RULES

- ☐ The winners of the competition will be the people who number the games features correctly and enter the most original name for a computer game in the view of the editor.
- ☐ The name of the winners will be printed in the August issue of *Your Computer.*
- ☐ All entries must arrive at the *Your Computer* offices by the last working day in June 1984.
- ☐ Each person may enter the competition only once.
- ☐ Entries to the competition cannot be acknowledged.
- ☐ No employees of Business Press International or their relatives may enter the competition.
- ☐ The decision of the editor is final.
- ☐ No correspondence on the result of the competition will be entered into.
- ☐ Business Press International assumes no responsibility or liability for any complaints arising from this competition.

AMSTRAD Competition

Put a 1 against your favourite feature of computer games, a 2 against your second favourite and so until you have filled all the boxes. Now think of an original title for a computer game and send this coupon to *Your Computer*, L-221, Quadrant House, Sutton, Surrey SM2 5AS.

- ☐ Easy loading
- ☐ High resolution graphics
- ☐ Different screens
- ☐ Sound effects
- ☐ Quick reactions
- ☐ Problem solving
- ☐ User definable controls
- ☐ Realism

Title...

Name________________________________

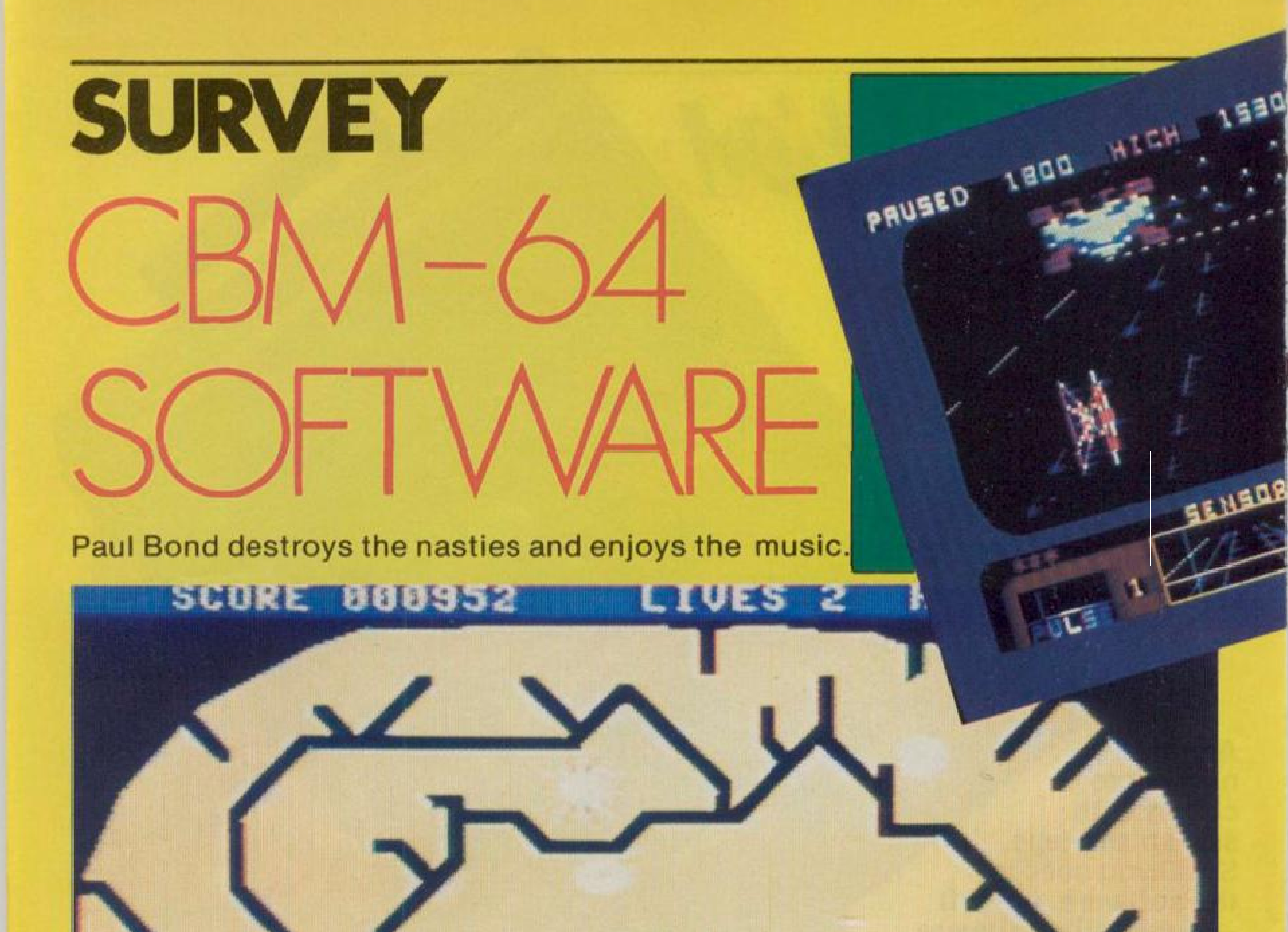
Address________________________________

____

SURVEY

CBM-64 SOFTWARE

Paul Bond destroys the nasties and enjoys the music.



SIGNIFICANTLY FOR a computer with such a large memory — 64K of onboard RAM — one of the more original games programs for the Commodore machine features a sidelong slice of the cerebellum as its screen display. Zyco is an alien enslaving the human race. The goal of Ace's Mind Control maze game is to steer through the cortical convolutions until you reach Zyco's nerve centre.

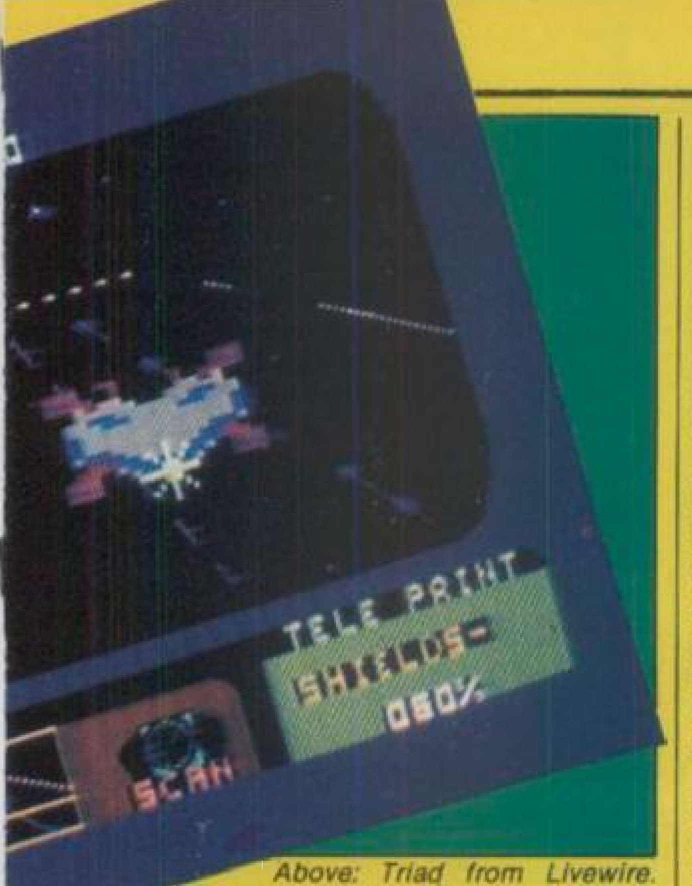
You have to dodge the white blood corpuscles and avoid bumping into cell walls otherwise you will revert to human size and die. It's a scenario straight out of that science-fiction phantasmagoria The Fantastic Voyage which should be remembered if only for the fact that it succeeded in cramming Raquel Welch into a mini-sub.

The game is a little like that reflex-testing game, sometimes encountered at small country fetes where you have to move a wire along a complex wire loop without touching it and making the bulb light up. Taxing but potentially tedious. Anyway, if you de-minaturised accidentally wouldn't you kill Zyco?

Bach's Toccata and Fugue in D minor (Schmieder number BWV 565). Can you dig it? CBM-64 programmers certainly can as it appears in two of the games programs I looked at for this issue. Perhaps that old SID chip has sympathetic vibrations with the classics.

Paramount's Megawarz is good solid shoot 'em-up space trip stuff. Waves of aliens attack in threes as you pump endless shells into them. Eventually they blow up. Then you have to rescue astronauts floating around in space. But you must be snappy or else they mutate into weird flapping mutants rather like commuters who have just been told that the 8.30 train has been cancelled.

On the third screen there is a terrible melee of aliens and astronauts and the potential for carnage would be unbelievable, except that you can't kill your own spacemen. When you warp from screen to screen you also get a quick blast of Richard Strauss's Also Sprach Zarathustra, which was such a big hit for the lad when it was used as theme music for Kubrick's 2001: A Space Odyssey. If you score more than 50,000 you join the mega-mortals. The screen graphics are stolid rather



Above: Triad from Livewire.
Left: Mind Control from ACE.
Below right: Megawarz from Paramount.

than exciting as is, ultimately, the game itself. But I loved the sound.

Bach's Toccata etcetera makes a comeback in Livewire's Triad. No relation to the Chinese secret society dedicated to the overthrow of the Ching dynasty, it nevertheless shows promise. What might be described by more fanciful software companies as a 3D game confronts you with wave after wave of smiling triads leering all the way up to the external reception apron of your starship as you zap away at them. Then you clear a path through a meteor storm. You get promoted. And so it goes — but once again the music is excellent.

Troopa Truck from Rabbit Software is a simple but colourful game, well-implemented and quite addictive. You drive a six-wheeled lunar buggy over rocky terrain backed by a diorama-style 3D landscape.

Defender in underpants

There are large black boulders to be disintegrated, red landmines and chasms to hop over and also unfriendly flying objects which shoot at you and generally do their best to discourage Bank Holiday traffic. The buggy makes a good chugging sound, there is incessant music but Bach is not responsible. You can naturally shoot down said UFOs.

But if driving trucks is not your bag, you'll believe a man can fly with Ace's Krypton. In this you are cast as a superhero — no names, no pack-drill — and you have to destroy the enemy superbeings. You also have to try and save your girlfriend — who is ridiculously small at this resolution — from falling off a skyscraper. It's Defender in red underpants — and watch out for the mobile ground control pod which shoots lumps of kryptonite at you. An enjoyable enough game but not really very original apart from the fancy-dress.

Also not very original in concept is the Q-bertesque Slinky from US Gold. But this program, which I reviewed on disc, is a very sophisticated and colourful implementation indeed making full use of the 64's sound and graphics capacities. You steer a slinky spring around cubes arranged in a pyramid. As the spring touches the faces of the cubes they change colour. When you have changed all the cubes you get a blast of classical music — no, not Bach but Tchaikovsky! The 1812 Overture without the cannons — a great opportunity missed here, I feel. An interesting contrast with the menacing HM riff which introduces the five threats to Slinky's progress.

More exciting, and likewise available on disc from US Gold is Aztec Challenge. This has a rather lurid cover showing a doe-eyed Indian maiden being pursued by a chap in Quetzalcoat look-alike gear, but as far as I could get with the game it all seemed to be good clean fun, if running the gauntlet of spears, rock-strewn stairways and booby-trapped hallways is your idea of a healthy pastime, that is.

Music soundtrack for this game is once again excellent. The first screen display presents you with a view of an Aztec runner from the back running between two lines of warriors stretching away into the distance, ending at the base of a pyramid. The primitive pulse of native drums accompanies you as you run the gauntlet of deadly spears. Press joystick forwards to duck, pull back to jump. The spears whizz over at head-height or leg-level. You have five lives, but if you get caught once you usually get caught three or four times.

Anyway, you get sent all the way back to the beginning of the twin file of Indians. This is maddening. Eventually, you get to the foot of the temple steps. Far from encouraging a congregation the local preachers chuck cube-shaped rocks down the steps at those with temerity enough to mount them. You dodge the blocks. Once inside, trap-doors open up beneath your feet, spears fall from the roof and vertical saws spring up from the floor. Heard of high tech? Well, this is Az-tec. Full marks all round for a program that points the way for CBM-64 programming. It even has piranhas.

Forbidden Forest, also on disc from US Gold, is certainly very promising indeed. You, as an archer, have wandered into a dangerous area of the forest. Coming under attack from the residents which include giant spiders, bumblebees, and bouncing frogs you have to put an arrow in your bow — press fire button once — and fire it — press fire button again.

Even this is not very easy when a 10-ton tarantula is about to chew you up. Which they do — you struggle helplessly, and vast amounts of claret are spilled all over the forest floor. Not a game for those with a nervous disposition, especially if they are arachnophones. The graphics, if somewhat grisly, are certainly gripping.

Bugs in bugs game

Entomology rules the day in Mogul Software's Fire Ant as well. As the last free ant you must rescue the queen ant from her scorpion prison. Oviparous scorpions lay eggs all over the maze; gobble these, grab the golden keys and move from screen to screen. There are still a few bugs of the other sort in this program, even in the production version: for example, when you press Y to get instructions, you don't get any instructions.

Another criticism is documentation: there are lots of things to pick up which give you different sorts of immunity and ways to get through barriers to achieve the eighth screen. If accessing the instructions on the computer is impossible on some of the copies, as would seem to be the case, Mogul should have explained more about the game on the cassette inlay. Nevertheless, a challenging and absorbing game. ■

Program	Company	Price
Mind Control	ACE	£6.99
Megawarz	Paramount	£7.50
Triad	Livewire	£8.95
Troopa Truck	Rabbit	£5.99
Krypton	ACE	£6.99
Slinky	US Gold	£9.99 (cassette) £12.99 (disc)
Aztec Challenge	US Gold	£9.99 (cassette) £12.99 (disc)
Forbidden Forest	US Gold	£9.99 (cassette) £12.99 (disc)
Fire Ant	Mogul	£7.95









PLUG IN TO REALITY

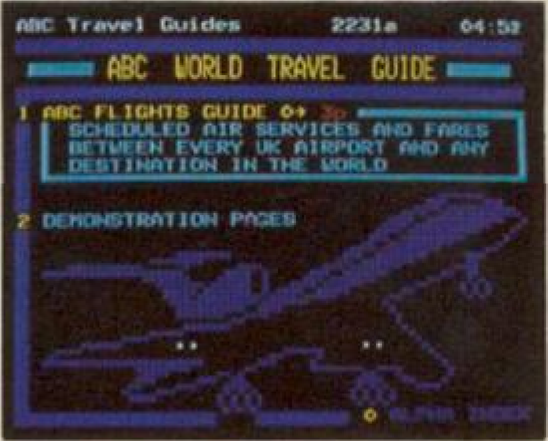


Inside your tame home micro a monster is struggling to break out and take over the world. A £50 modem will let you plug into Prestel, dip into databases and still do some teleshopping and stave off World War III before tea time. Richard Lambley delves deep into this unleashed potential.



PRESTEL 7a 0p
MAILBOX main index MAILBOX
MAILBOX is available on Enterprise computer, but the directory can be consulted anywhere - key 9 to see it
You may be registered on Enterprise already, especially if you live in the south of England (an entry in the MAILBOX directory isn't necessary). Key 1 to check or to request registration.
The telephone number for Enterprise is 01 (for customers outside London) 686-0311. You may need to ask your set supplier to alter your autodialler.
Key 2 to learn how to use the Prestel MAILBOX service.
0 other message services





WITHOUT A DOUBT, a modem is one of the most worthwhile additions your computer can have. It can cost far less than a disc drive or a printer and yet it can transform your system. With a modem, you can exchange software over the telephone, conduct your financial affairs, bombard your friends with electronic mail and go adventuring in multi-megabyte databases.

All you need to use a modem is a telephone plus a computer with an RS-232 serial port. If yours doesn't have one of these, or something like it, don't lose heart — it's quite possible to get one fitted.

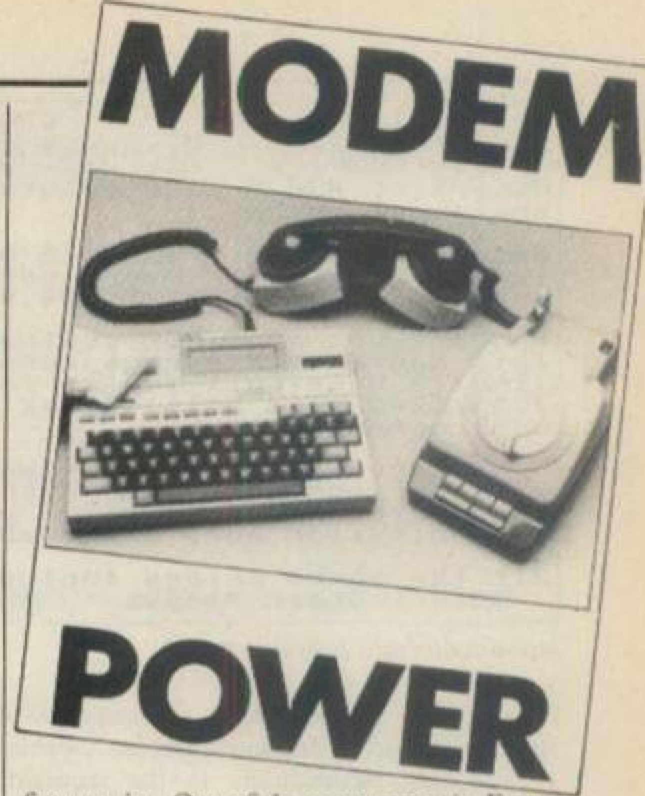
Having seen to that, what is there to dial up? To most micro owners, modems mean, if anything, Micronet 800. Micronet is a section of British Telecom's Prestel service, offering its subscribers a sort of computing magazine by telephone. There are thousands of pages, covering all the subjects you would find in a printed magazine. It includes news pages, reviews, technical advice, software, some of it free, club bulletins, mail and advertising.

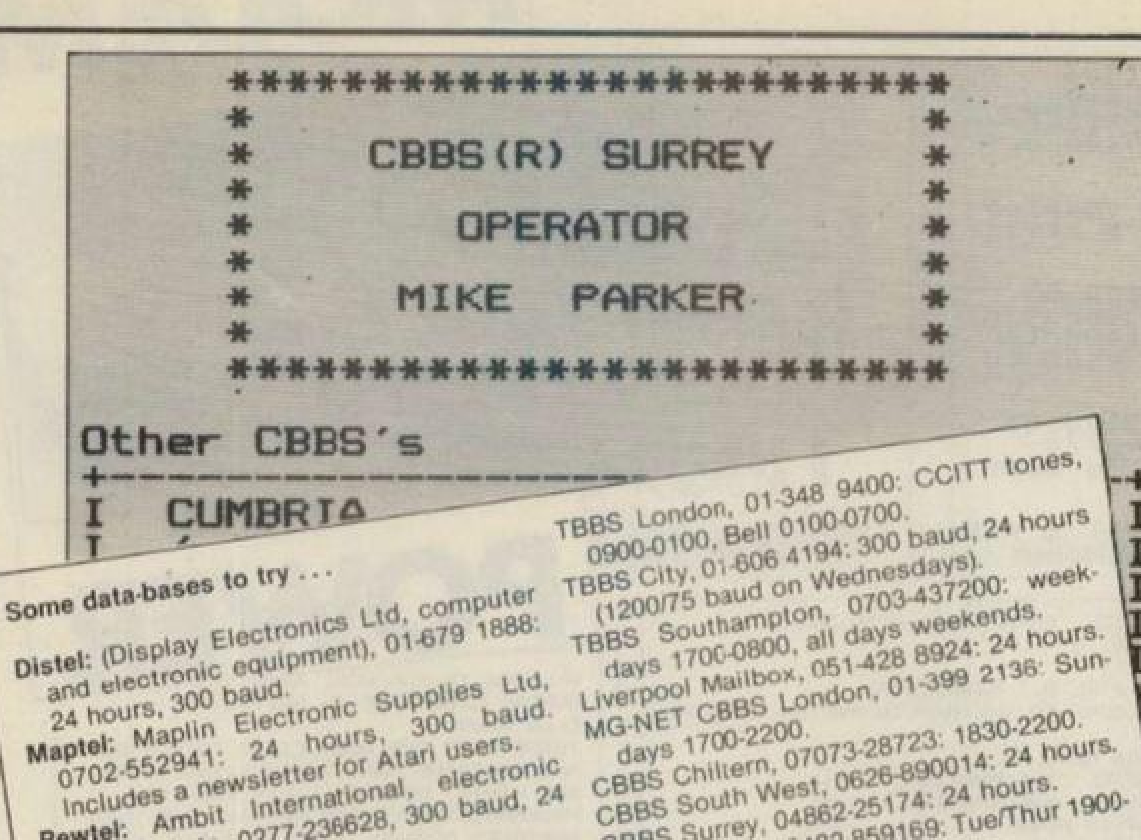


Certain sections of Prestel are, like Micronet itself, the preserve of closed user groups and so are barred to outsiders. But Prestel's other microcomputing database, Viewfax 258, is available to all, with more news, gossip, teleshopping and telesoftware.

From most parts of the country, Prestel can be accessed at local telephone call rates. Outside business hours there is no charge for using the computer. So it's possible to make extensive use of your modem without running up an enormous phone bill.

But beyond Prestel is a growing network of computer bulletin-board systems, run by private enthusiasts rather than businessmen. These fascinating systems are in some ways like





Some data-bases to try . . .

Distel: (Display Electronics Ltd, computer and electronic equipment), 01-679 1888: 24 hours, 300 baud.
Maptel: Maplin Electronic Supplies Ltd, 0702-552941: 24 hours, 300 baud. Includes a newsletter for Atari users.
Rewtel: Ambit International, electronic components, 0277-236628, 300 baud, 24 hours.

. . . and some bulletin boards

Note that these systems are provided freely by individuals whose generosity should not be abused. This list is far from exhaustive.

TBBS London, 01-348 9400: CCITT tones, 0900-0100, Bell 0100-0700.
TBBS City, 01-606 4194: 300 baud, 24 hours (1200/75 baud on Wednesdays).
TBBS Southampton, 0703-437200: weekdays 1700-0800, all days weekends.
Liverpool Mailbox, 051-428 8924: 24 hours.
MG-NET CBBS London, 01-399 2136: Sundays 1700-2200.
CBBS Chiltern, 07073-28723: 1830-2200.
CBBS South West, 0626-890014: 24 hours.
CBBS Surrey, 04862-25174: 24 hours.
Forum 80 Hull, 0482-859169: Tue/Thur 1900-2200, Sat/Sun 1300-2200.
CABB London, 01-631 3076: 300 or 1200/75 baud, 24 hours.
British Apple Systems Users' Group, 0742-667983: 24 hours.

```
... or even JOKES. To
... the word at the main menu, the
... automatically scan and retrieve any relevant
...ormation. You can also enter messages that will be retrieved
with this function by simply putting SALE or JOKE in the subject
title of the message.

More facilities have been introduced, namely individual program
areas. If you wish to gain access to CPM programs then at the
main menu simply enter CPM. The same facilities apply to ATARI,
IBM, APPLE and BBC. If you would like any other areas then let me
know but remember we must have programs to fill these areas, so
please support us by donating software. Note you will only get
access to these areas if you are registered with us.
```

Prestel in miniature, though always with a distinctive character of their own. Often the hardware and software are the work of the system operator himself. Facilities include message handling and, often, software downloading.

Bulletin boards make no charge for access, although they may ask regular users to register with them. Those who have tried them seem to find them irresistible. Commercial bulletin boards exist too.

There is also a considerable number of dial-up databases for business users, with information on subjects such as the law, finance and engineering; but these systems are mostly beyond the financial reach, and perhaps the range of interests, of the average home user.



In essence, a modem is simply a gadget for converting between the on-or-off voltages of a digital computer and the audio frequencies for which the telephone system was designed. Telephone circuits can't easily handle pulses, so the modem gets round the difficulty by translating your ones and zeroes into audible tones. For example, a high pitched tone could represent a 1 and a lower one a 0.

Each byte to be transmitted must be presented to the modem in serial form — one bit after another, until all eight have been sent. This is the job of the serial interface in your computer — the UART chip. If you eavesdrop on the lines, the effect you hear is a burble or buzz similar to the sound of your program cassettes.

Of course, when you dial up someone else's computer, you probably want to communicate in both directions at once. Doing this is known as duplex working, and it is achieved by assigning a separate pair of tones for the answering modem to send. The word modem, incidentally, is simply a contraction of MOdulator-DEModulator.

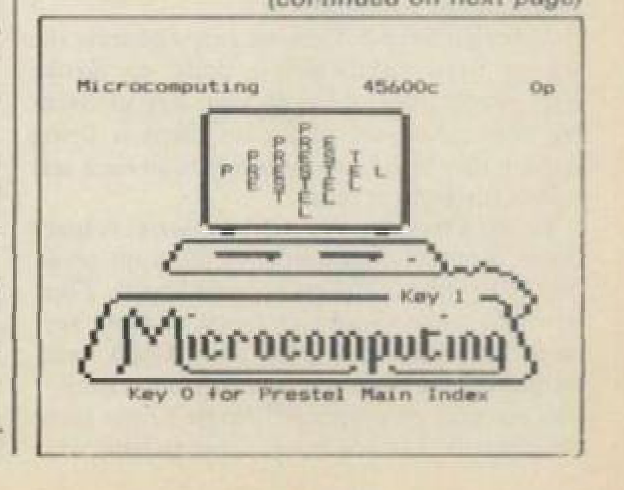
In practice, things are more complicated because there is more than one standard set of frequencies. One of the commonest in Europe is the CCITT V.21 standard, which offers two-way communication at 300 bits per second, or 300 baud. Most of the bulletin-board systems popular with computer networking enthusiasts follow this standard, which corresponds to a sending speed of about 30 characters per second.

The other widely-used European standard is the asymmetrical 1200 baud/75 baud V.23 standard adopted for Viewdata systems such as British Telecom's Prestel. Here, the data flow is much faster in one direction than in the other. Normally the Prestel computer is busy churning out pages to be looked at, while the return path, or back channel, conveys just the occasional byte or two to signal the subscriber's next selection. It may not sound much, 75 baud, but it is fast enough for the purpose: few people can keep up a typing speed of 70 words per minute.

Several further European standards exist, including a 600/75 baud system. And in America there are yet others. Bell 103 is a 300 baud standard equivalent to the European V.21, though with a different choice of tones; and there is a Bell 'half-duplex' standard (Bell 202) which is rather like the Prestel, except that data is sent in the back channel simply by switching the tone on and off instead of frequency-shifting it. The back channel is useful mainly for hand-shaking, to determine which of the two computers will transmit at a given moment.

Until recently, modem buyers had to decide which database or bulletin-board they were most interested in, and to put up with being excluded from systems operating on other

(continued on next page)



MODEM POWER

```
MICRONET 800 (C)            600424130a    0p
    BBC Model B - Micronet Connection
Owners of BBC B microcmputers have a
choice of modems.

Acoustic Modem: A 1200/75 baud coupler
together with ROM based software still
remains good value at £74.95

Modem 1000: plus ROM software £93.65.
This modem is a direct connect version
1200/75 baud full duplex for viewdata
1200/1200 baud half duplex for user to
user communication.

Modem 2000: plus ROM software £108.65
A direct connect modem with 1200/75
baud rate, plus 1200/1200 user to user
communication auto switchable.

All the above prices includes VAT & P&P
  GOTO 1 Other Micros       9 Main Menu
```

```
MICRONET 800 (C)
  Teles
  Supe
  WHERE GOOD
 11 BBC
 12 SPECTRUM
 13 APPLE
 14 PET
 15 TRS 80

  4 Software f
  5 Telesoftwa
  9 Micronet m

 7 From the F
```

(continued from previous page)

standards.

The picture has now begun to change, with the introduction of dual-mode systems capable of switching automatically to the standard adopted by the caller. But the introduction of a modem chip capable of handling all common signalling standards is bringing to the shops a crop of universal modems suitable for whatever applications the hobbyist is likely to find. The complex filtering needed to achieve reliable generation and detection of the tones is all dealt with on the chip, so the new modems are relatively simple in construction and competitive in price.

Here we meet the issue of acoustically-coupled modems versus the direct-coupled type. Acoustic modems have been popular with home users because they're portable, simple to use and involve no electrical connection with the telephone line. Having dialled your call, you just wait for the answering tone and press the telephone handset into the rubber cups on the modem. Then they squawk to each other. Unfortunately, noise from the room can be picked up and mixed in with the data, so errors may occur. So you may prefer to use a direct-connect modem, which plugs straight in to your telephone socket, eliminating this source of interference.

Many direct-connect modems are now available for the home user, although not all of them are smiled upon by the telephone authorities. Equipment to be connected to telephone lines has to be submitted by the manufacturer for approval; and obtaining a certificate can be a slow and expensive business. Some modems on the market do not have this approval, even though they may be perfectly sound technically. Potential users should be warned that, despite recent relaxation of many of the restrictions surrounding our telephone system, it's now actually an offence to connect unauthorised equipment to it.

Although British Telecom can withdraw the service from malefactors it finds, or invoke legal proceedings, it has no easy way of catching them. And so, where no harm is being done, it may be be content merly to sit back and collect the extra revenue.

To use a modem, you need software. A bare-bones program would first set up your serial port to operate at the appropriate speed. Then it would route characters typed at your keyboard to the serial port and would send incoming data from the port to your screen.

A practical program needs to be a little more complicated. For one thing, it has to cope with

```
MAPTEL  06-APR-84  TIME 23:12
PAGE..0

(MAPTEL B.  RJBK/24/A)
WELCOME TO THE MAPLIN MAPTEL COMPUTER

MAIN MENU
MAPTEL  INFORMATION... (1)
CASHTEL INFORMATION... (2)
MAPLIN NEWS........... (3)
ELECTRONICS MAGAZINE.. (4)
COMPUTER NEWS......... (5)
USER GROUP NEWS....... (6)
HELP.................. (7)
CASHTEL B ............ (8)

ENTER OPTION (M=MENU.H=HELP.E=END.)6
```

possible variations in the make-up of the data word.

Before each byte, a start-bite is sent to indicate that data is to follow. Then afterwards, there may be either one or two stop-bits. In the middle, the length of the byte itself may vary: Prestel, for example, gets by with only seven bits instead of eight. There may also be a parity bit as an insurance against errors in transmission, and it can be either odd or even. So you can see that many different permutations are possible.

To show what you are typing, your own input must be echoed back to you. If the computer at the other end does not give an echo, you will want to provide your own. Another option you may want incorporated in your software is reprogramming of some of the characters sent by your keyboard. For example, your delete key may produce strange results on some systems and it helps if you can alter its effect to suit the other computer.

It is often desirable to be able to halt the flow of data from the remote computer while you perform some background task — saving something to disc, perhaps, or answering the door bell. For this you can use the so-called Xoff and Xon signals, Ctrl-S and Ctrl-Q.

If you want to download program or text

```
WELCOME TO THE U.K.
OWNERS CLUB PAGE ON MAPTEL.
CLUB NEWS.
ISSUE 4 OF THE NEWSLETTER IS NOW OUT
AND CONTAINS MANY INTERESTING TIPS
AND HINTS, PROGRAM LISTS SUCH AS
PECKMAN,STUNT RIDER,HEX,AND COMPUTER
ASSISTED DESIGN. IT ALSO HAS A REVIEW
ON JOYSTICKS AND ARTICLES ON DISPLAY
LISTS AND ADDING TEXT TO GRAPHICS 8.
PLUS OUR USUAL FEATURES INCLUDING THE
SOFTWARE LIBRARY EXCHANGE AND CONTACT
SECTION.

   ENTER CR <  TO CONTINUE -
```

files, you will need a buffer in memory into which each block of data can be loaded as it arrives, ready for saving when the file is complete. Some software packages offer elaborate techniques for ensuring accurate file transfer. A widely-used standard is the Xmodem or Christiensen protocol, by which the receiving computer calls for a repeat of any block of data found to be corrupt.

Source of modems

For Prestel users, a ready source of modems and terminal software is Micronet 800, which can provide 'communications packs' to suit a range of popular micros. Software for 300 baud modems is available from a variety of sources. Maplin Electronic Supplies, who offer a modem construction kit at less than £45, can also supply serial interfaces and software for the Dragon, Oric, Vic-20, Commodore-64, ZX-81 and Spectrum.

Best served, perhaps, are the long-established TRS-80 and the BBC Micro. Users of the BBC Micro have a choice of two excellent ROM packages: Communicator 16K from Computer Concepts and Commstar 8K, from Pace Software Supplies. The latest version of Commstar includes a Prestel mode which allows telesoftware downloading. ■

Useful addresses

Buzzbox 300 baud: Scicon, Brick Close, Kiln Farm, Milton Keynes MK11 3EJ, 0908-567567.

Minor Miracles: Miracle Technology, PO Box 48, Ipswich IP4 2AB, 0473-50304.

Grapevine, Commstar ROM: Pace Disc Systems, 92 New Cross Street, Bradford ED5 8BS, 0274-729306.

Micronet: Prism Microproducts, 18/29 Mora Street, London EC1V 8BT, 0274-729306.

Tandata: Tandata Marketing, Albert Road North, Malvern, Worcestershire WR14 2TL, 337617; Prestel page 799.

Maplin 300 baud kit, interfaces and software: Maplin Electronic Supplies, P.O. Box 3, Rayleigh, Essex SS6 8LR, 0702-554155.

Software for the TRS-80: Molimerx, 1 Buckhurst Road, Town Hall Square, Bexhill-on-Sea, East Sussex, 0424-220391.

Communicator ROM: Computer Concepts, 16 Wayside, Chipperfield, Hertfordshire WD4 9JJ, 09277-69727.

Micronet 800: Scriptor Court, 155 Farringdon Road, London EC1R 3AD, 01-278 3143.

FREE CHIPS WITH EVERY RENAULT 9.

Buy any new Renault 9 between April 1st and May 31st and we will give you a Sinclair Spectrum 48K home computer, complete with software pack.†

It's a gift that perfectly complements the high-tech features of the new Renault 9 GTX. Like aerodynamic styling and a five speed gearbox to save fuel!†† And infinitely adjustable monotrace seating to make driving more of a pleasure.

Electric front windows, centralised door locking and all-round tinted glass are available as an optional Custom Pack.

There are six Renault 9s from 1100 cc to the new 1.7 litre model, including diesel and automatic versions, plus the new Special Edition Renault 9 Avenue.

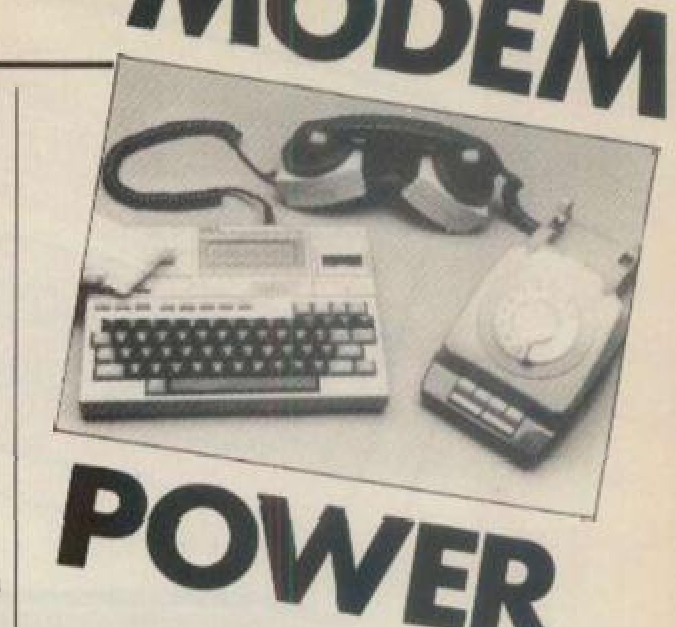
All you have to do is choose. And, if you choose soon, the chips are on us.



FROM £4,645.* WITH FREE SINCLAIR SPECTRUM HOME COMPUTER.

†Offer limited to one Sinclair ZX Spectrum and software pack (Philips tape drive unit and a selection of software packages) per customer and applies to all new Renault 9s ordered and registered between 1st April and 31st May, 1984. ††Government test figures: Renault 9GTX, 56 mph 55.4 mpg (5.1L/100 km), simulated urban cycle 32.1 mpg (8.8L/100 km), 75 mph 40.4 mpg (7.0L/100 km). *Price refers to Renault 9 TC (correct at time of going to press) and includes 15% VAT, Car Tax and front seat belts. Number plates and delivery extra. Car featured Renault 9 GTX. **RENAULT recommend elf lubricants.**

TUNE IN TO BBC



John Dawson looks at Commstar — a communications program for the BBC.

THE COMMSTAR PACKAGES from Pace Software Supplies is the third link in a communications chain between two computers. When you have a modem connected to a telephone line, and a microcomputer connected to the modem, you only need a program to control the computer to put you in business.

Commstar is a communications program which will allow you to use your BBC Micro as either a dumb terminal to a remote computer, or as an intelligent machine, able to send and receive files with full error checks to ensure accuracy.

Computers using the CP/M operating system can use the Peripheral Interface Program (PIP) to transfer a file of information out to the paper-tape punch or in from the paper-tape reader. These obsolete terms conceal the fact that a modem can act as both a reader and punch.

But that is terribly clumsy, allows no conversation with the remote computer and has no error-checking capacity. It is a little like standing in a dark room, shouting into the silence and hoping that someone will hear you.

Proper CP/M communications programs are not particularly new and there are a number of more or less unfriendly packages that have been available for some time. ASCOM, BSTAMS and BSTMS are all designed to link two computers for the purpose of transferring files. Most of them will only handle ASCII text files because the ASCII control codes are used, as they should be, for various control purposes in the course of data transmission.

Commstar changes all that, providing instead a friendly, orderly and effective means of transferring information from one computer to another. The program is easy to use and the following functions are available:

1 Initialise the BBC Micro RS-423 interface.
2 Chat to a remote computer.
3 Store incoming data in a buffer area of memory.
4 Save the buffer on tape or disc.
5 Load the buffer from tape or disc.
6 Output the buffer to the remote computer.
7 View the buffer on screen and copy it to a printer with a Centronics interface.
8 Transfer files from one computer to another using the Xmodem standard.

In addition to these main functions, Commstar has the following facilities:

- ☐ Elapsed time clock
- ☐ 40-or 80-column display
- ☐ XOn/XOff protocol
- ☐ Screen display can be switched on or off
- ☐ Auto line feed can be switched on or off
- ☐ MOS commands can be executed from within Commstar

(continued on page 91)

```
PACE Commstar (C) A.Hood 1983     00:36

<B> Copy to buffer      <L> Load Buffer
<R> Reset buffer        <S> Save buffer
<O> Output buffer       <V> View buffer
<W> Wipe buffer

<A> Auto Line Feed      <E> Echo switch
<I> Initialise 423      <M> MOS command
<T> Text mode 7/3       <X> Xon/xoff

<C> Chat Mode
<F> File transfer

Buffer  OFF    Echo  OFF   Xon/Xoff OFF
Auto LF OFF

0000 Characters in buffer : 6000 free

Select ?
```

⑫ MODEMS

available for Spectrum Apple BBC and other RS232 Computers.
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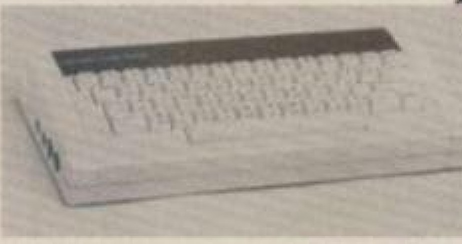
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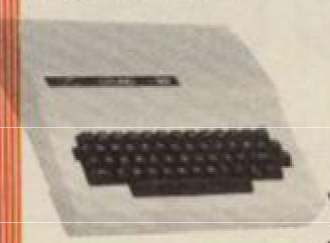


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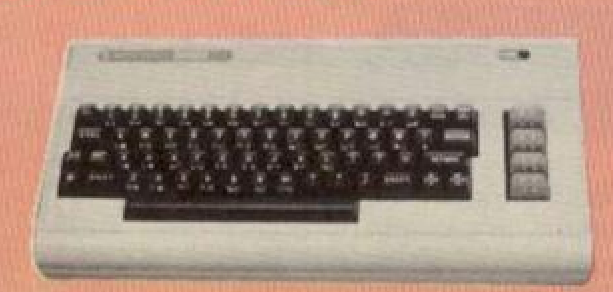


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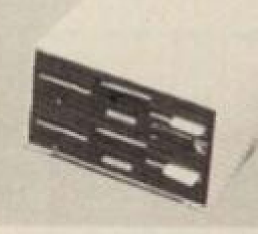
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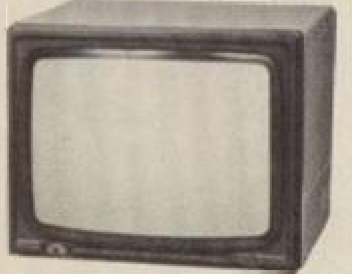
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Cuthbert

ON THE

Commodore 64



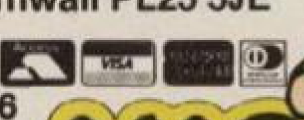




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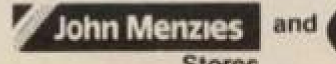
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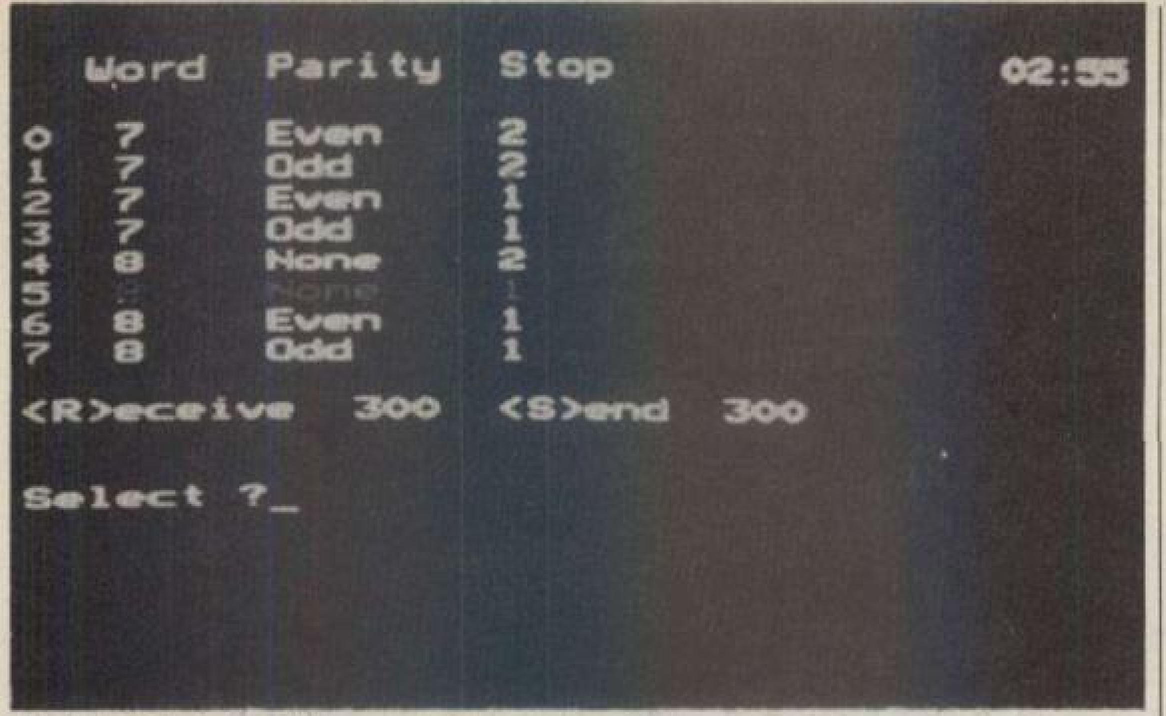
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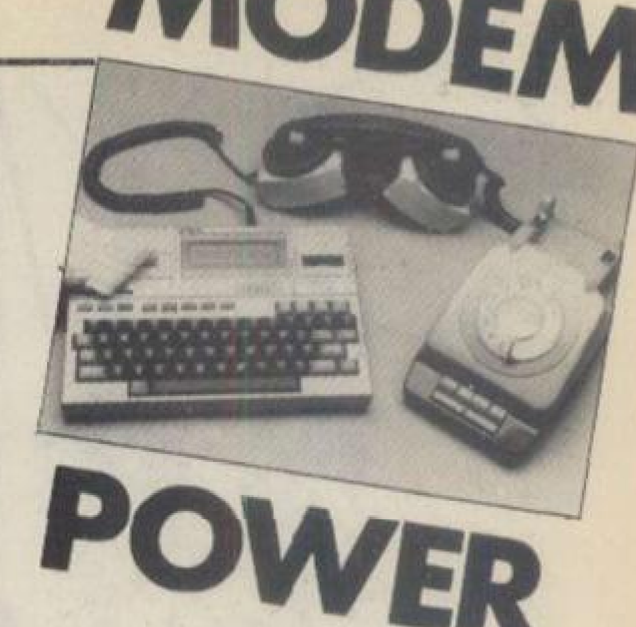
Selected Microdeal Titles available from computer dealers nationwide or from larger branches of



and







(continued from page 85)

There is a menu for initialising the RS-423 interface. You can select one of the word length — stop bit — parity patterns by typing one of the numbers in the left-hand column and the baud rates shown at the bottom of the screen can be altered by typing either R or S.

The receive or send rate steps through the usual selection of rates from 75 baud to 9,600 baud each time one of the keys is pressed. Setting up the interface is very easy.

When you dial a number with your computer connected to the telephone line and somebody or something answers at the far end you may want to do any one of several things. If it is a friend on the line, you will probably want to talk to him or her before using your computer to send messages or programs down the line.

Hear answering tone

If you are connected to British Telecom's Packet Switched Network, you will hear only the answering tone of a modem at the far end. In this case you will have to identify yourself to the remote computer, and to do this the communications package you are using must allow you to type on the keyboard, sending the characters to the remote computer which will echo them back to your machine for display on your VDU.

Commstar calls this the Chat mode because you can hold a dialogue with the remote computer where keystrokes on either machine will show up on your terminal — you can Chat with someone at the far end.

While you are chatting with the remote computer you may wish to send a message that you have already prepared and stored in a file. Equally likely, you may want to receive a program or file from the remote computer, storing this in the memory of your machine until you can save it on tape or disc.

You can access the transmit and receive file functions from Chat mode without having to return to the main menu. Commstar will not load a file from tape or disc while in Chat mode but will send the current contents of the buffer to the remote computer or load material from the remote machine into the buffer.

You can then return to the main menu and save the buffer to the current filing system. This structure for the Commstar program works well and is really the only possible architecture for a computer that may be used with a tape-filing system.

Sending the contents of the buffer to the RS-423 port is a way of uploading a file to the remote computer. Some systems respond to a set of buffer control codes — Forum 80 is an example — and Commstar has an option that will automatically open the buffer in the remote machine and close it again when the file transfer is complete.

If the buffer in your machine fills up while material is being transmitted from the remote machine, Commstar will issue an XOff character to try and halt the flow. At the same time the copy-to-buffer operation is switched off and you can save the buffer to tape or disc.

After wiping the buffer, you may turn on the copy-to-buffer option and send an XOn signal to resume the halted transmission. If you are using a cassette tape recorder running at 1,200 baud it will take you about three and a half minutes to save the 24K buffer.

That is not going to do your telephone bill any bood but it is unlikely to happen often as it will take nearly 15 minutes continuous reception to fill the buffer at 300 Baud.

Obviously a disc system will save the buffer much more quickly and you can reckon to download a file of any size from the remote computer if you have discs at your end.

Using the 80-column screen reduces the size of the buffer to about 9,000 characters, which is still adequate for many of the transactions you are likely to make.

The file-transfer section of Commstar is the most sophisticated section of the program. Data is sent down the line using Ward Christiensen protocols and handshaking. The data is automatically broken up into 128-byte blocks and each block is sent with its own number and checksum.

If the remote computer signals an error, the block will be retransmitted up to 10 times to try to overcome the corruption. As the manual says: "This system virtually assures perfect data transfer even under extreme conditions such as temporary loss of carrier signal, excessive line noise or even temporary disconnection of the modem."

It is necessary, of course, for the remote computer to use compatible software. Communications between two BBC Micros using Commstar should be very easy under most line conditions. With the BT packet switched network I have experienced little trouble both in London and the country using the ordinary buffer output and copt-to-buffer options.

Commstar will send and receive both ASCII text files and binary-coded programs. Some machine-code or Basic instructions can look liek control codes to many communications programs and Commstar overcomes this problem by translating the buffer contents into expanded ASCII files before transmission or back into binary codes before the buffer is stored on tape or disc.

The transfer of programs

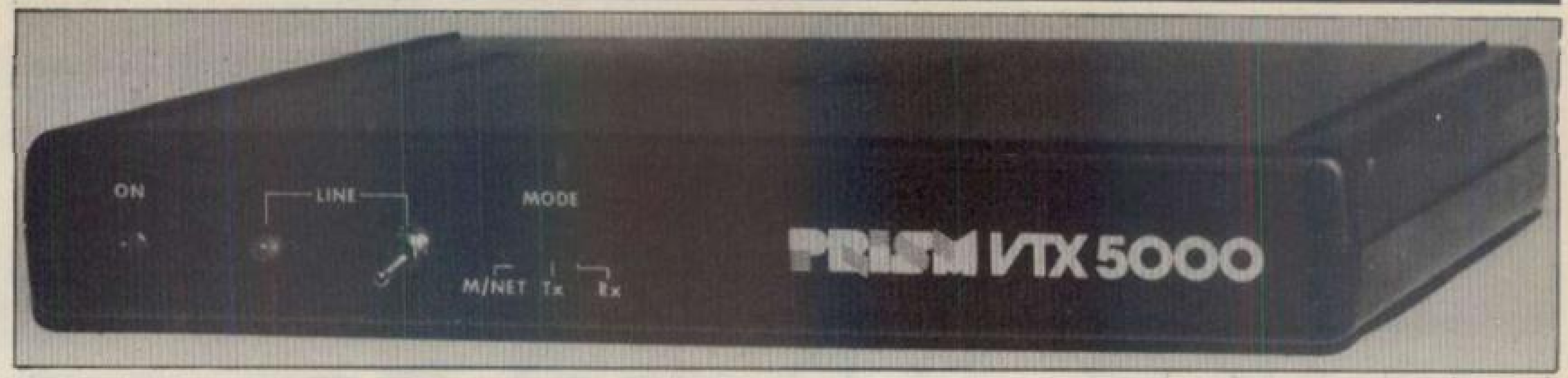
This option is enormously useful as it allows the transfer of machine-code programs just as easily as letters, patients' records or sales reports.

The Commstar chip is supplied with a 37-page manual which includes a glossary of telecommunications terms and a good index. The manual is clearly written and laid out. A registration postcard is included in the front of the manual which offers follow-up information and program updates to genuine purchasers of the package.

Each section of the manual is easy to understand and if Commstar is the first additional ROM chip you fit to your BBC computer, you will have little difficulty if you work through the instructions in the manual.

Apart from very slight lapses, the Commstar manual is a model for others to imitate. It would have been helpful, for example, for the manual to have confirmed that files produced by Commstar are compatible with Wordwise and View — they are. Similarly, you can prepare a text file with one of the BBC word processors and then upload it to a remote computer using Commstar.

Pace Software Supplies has an excellent reputation for backing-up sales. Commstar is a super piece of software, allowing you to communicate with microcomputers and mainframes; receiving and transmitting text, data and programs. The package works well and offers excellent value for money, I expect to see it used widely in university laboratories, homes, schools and doctors' surgeries. ■



PRESTEL ADAPTORS

MODEM POWER



Jack Russell reviews adaptors for the Spectrum, BBC and ZX-81 micros.

THIS REVIEW COVERS several packages available for the popular BBC Micro and ZX Spectrum computers which allow them to operate as viewdata terminals. This means that services such as Prestel can be accessed without having to buy a special terminal.

The VTX 500 ZX Spectrum adaptor consists of a flat black plastic box containing the modem which fits under the computer. There is a ribbon cable and connector which plugs into the back of the Spectrum and further devices such as a printer can be connected on to a spare connector on the ribbon cable. There is a telephone type cable out of the VTX 5000 which will plug into a standard British Telecom wall socket.

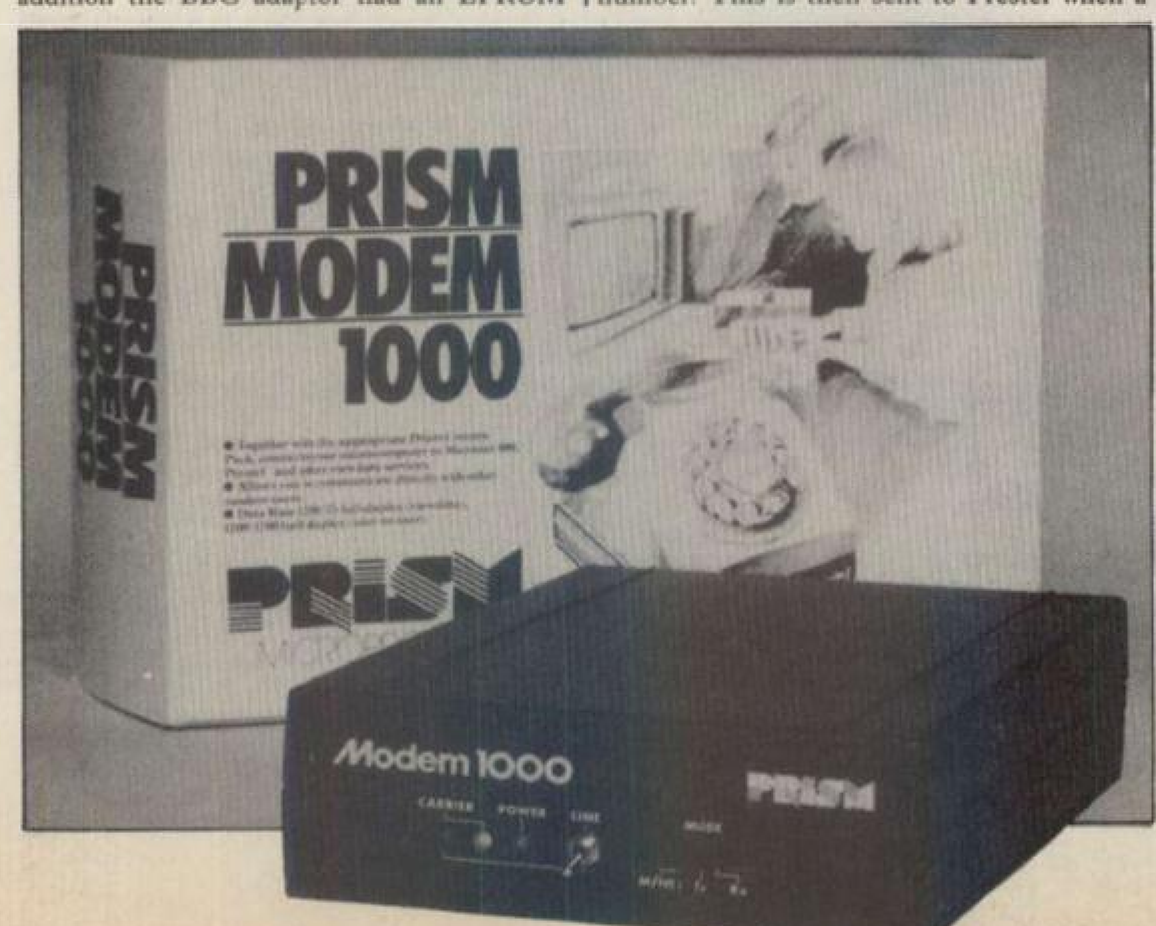
Your telephone then plugs back into a socket on the back of the adaptor, allowing you to use the phone normally. The BBC system supplied had a slightly larger box which attached to the computer via a cable into the RS-423 connector. This box could then be placed under the telephone. In addition the BBC adaptor had an EPROM chip which had to be fitted into one of the spare "sideways" ROM sockets in the computer.

When the Spectrum is switched on a start up screen appears inviting you to press any key. When this is done the Main Menu is displayed. To get to this stage on the BBC Micro the comamnd.

*MIC.

needs to be typed. It is from this menu that all the features of the package can be controlled. Items on the menu include: log on, temrinal operation, save/view frames, print frames, download and mailbox editor.

To use Prestel it is necessary to log on to the system. When the menu option to do this is selected the program prompts for your ID number. This is then sent to Prestel when a connection is established. Upon dialling up the Prestel phone number and flipping the swich on the modem to on line the screen is cleared and the Prestel sign-on frame appears.



All normal Prestel facilities can then be used. Frames can be read just by pressing the number keys and the special keys * and £. To return to the menu the keys Caps Shift and Enter on the Spectrum or Tab on the BBC are used. This allows the use of other functions in the package such as saving frames on tape or disc, printing and so on.

Everything appeared to work correctly so next I tried downloading a 'free' telesoftware program. The downloading operation seemed to work well but I was not too impressed with the quality of the 'free' programs on offer. On the Spectrum it is neccessary to restart the terminal program after downloading because the support program gets overwritten by the downloaded one. When this restart function is performed the main menu is displayed again and selecting the Terminal option takes you back to Prestel.

The final function provided was an editor to prepare mailbox frames while offline. I was not impressed by this part of the package as only one line at a time can be edited and it is not possible to correct errors in earlier lines; the whole message must be retyped from the start. I'm sure that improvements could be made here. However, I think that the Mailbox facility is one of the most exciting things about Prestel.

The modem hardware worked well and I had no trouble downloading some software. The Spectrum package in particular was impressive in being able to produce a 40 column full colour Prestel display.

(continued on next page)

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THE ZX-81 AND PRESTEL



MODEM POWER

THE ONLY Sinclair ZX-81 Prestel adaptor on the market is sold by Microcomputer Resources Ltd. It can operate with either acoustic coupled or direct connect modems which are now available from several sources.

The adaptor consists of a small black box similar to a 16K RAMpack. The ZX-81 expansion bus is connected right through the box allowing the continued use of other peripherals such as a ZX Printer. To use the Prestel adaptor a 16K RAM pack is required.

40 column display

Upon plugging everything together and powering up the normal cursor appears. The documentation I had was marked preliminary but it was quite comprehensive and covered all the adaptor functions in some depth. To start the adaptor a Rand USR 8192 command is typed. The display that then appears has 40 columns instead of the usual 32.

Unfortunately, it is not possible to read all 40 columns at once on a standard TV screen. However, there are some function keys provided that cause the whole screen display to scroll sideways. I found this feature inconvenient to use especially when trying to read Prestel screens, as on things like news stories the complete 40 column screen width is used.

The Prestel double height and graphics modes are fully supported by the adaptor — quite a programming feat by the software writer. Facilities missing are flash, conceal/reveal, and all the colour features. I got used to the lack of these things after a few minutes.

Other facilities provided by the adaptor are the ability to save Prestel frames in memory and to recall them for later viewing. If necessary the frames can be written on to tape using the fast cassette interface provided. I found saving and recalling frames easy but the tape playback level had to be set very carefully. It is possible to download telesoftware from Prestel which can then be saved and run in the normal way. Any program line that is garbled or does not comply with ZX-81 Basic is headed by a Rem statement for later editing by the user.





It is also possible to use the adaptor in 'local' mode where Prestel-like frames can be composed by typing characters on the keyboard. It is a very time consuming process as to make for example a double height line it is necessary to press Shift and Newline simultaneously followed by E to send an ASCII 'Escape' character, followed by Shift M to go into double height mode. To use the Prestel graphics character set requires a similar feat of key pressing.

Once a frame has been composed on the screen it can be stored on cassette, in memory or even transmitted to Prestel. In this way mailbox messages can be prepared off-line then sent to their destination in one burst, minimising telephone charges. I tried sending some mailboxes using this method and it worked very well.

To add even more versatility into this adaptor design, it can be used to access other databases which do not use the special Prestel characters, but instead require a "dumb" terminal. This allows use of, for example, many of the bulletin board services now operating. The same facilities of frame storage, printing and so on are still available in this mode.

In conclusion, the adaptor is a very impressive piece of work when considered against the limitations of the ZX-81 display and keyboard. It certainly offers the lowest cost way of accessing Prestel as well as other databases. It costs £29.95 and is available from: Microcomputer Resources, 1 Branch Road, Park Street Village, St Albans, Hertfordshire. ■

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PRO 1000

Ergonomically designed handle and base • 8-way arcade quality leaf switches for precision control • 5 foot cable to allow more comfortable playing positions • Rubber return for smooth control • Rubber protector pads on base • Base fire bar for left or right hand control •

PRO 3000



All the winning features of the Pro 1000 plus top fire button for precision one handed play • trigger fire button for true arcade realism •

PRO 5000

Again all the winning features of the Pro 1000 but incorporating true craftsmanship plus large 1¼" control knob for comfortable play • Unique tapered shaft for maximum sensitivity • Dual independent fire buttons • Nylon covered steel shaft for maximum robustness

KEMPSTON JOYSTICK INTERFACE FOR THE ZX SPECTRUM

Allows the use of any Atari/Commodore type joystick with the popular ZX Spectrum computer. With well over 100 games on the Spectrum now compatible with the joystick this is a must for any Spectrum owner who wants the power of a joystick added to the power of the Spectrum. Simply plugs into the edge connector at the back of the Spectrum. No modifications necessary.

Some games you can buy were produced before Joysticks were available for the ZX Spectrum. With the aid of Kempston conversion tapes these games can now be played with any of the Kempston range of joysticks.

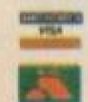


CONVERSION TAPE I
– Converts: Horace Goes Skiing, Hungry Horace, Flight Simulation (Sinclair), Arcadia, Penetrator, Spectres.

CONVERSION TAPE II
– Converts: Orbiter, Escape, Tanx, Centipede, Spectral Invaders, Cruising on Broadway, Frenzy.

CONVERSION TAPE III
– Converts: Ah Diddums, Jumping Jack, Molar Maul, Androids, Horace And the Spiders, Space Raiders, Winged Avenger, Muncher

ALL £4.95 each

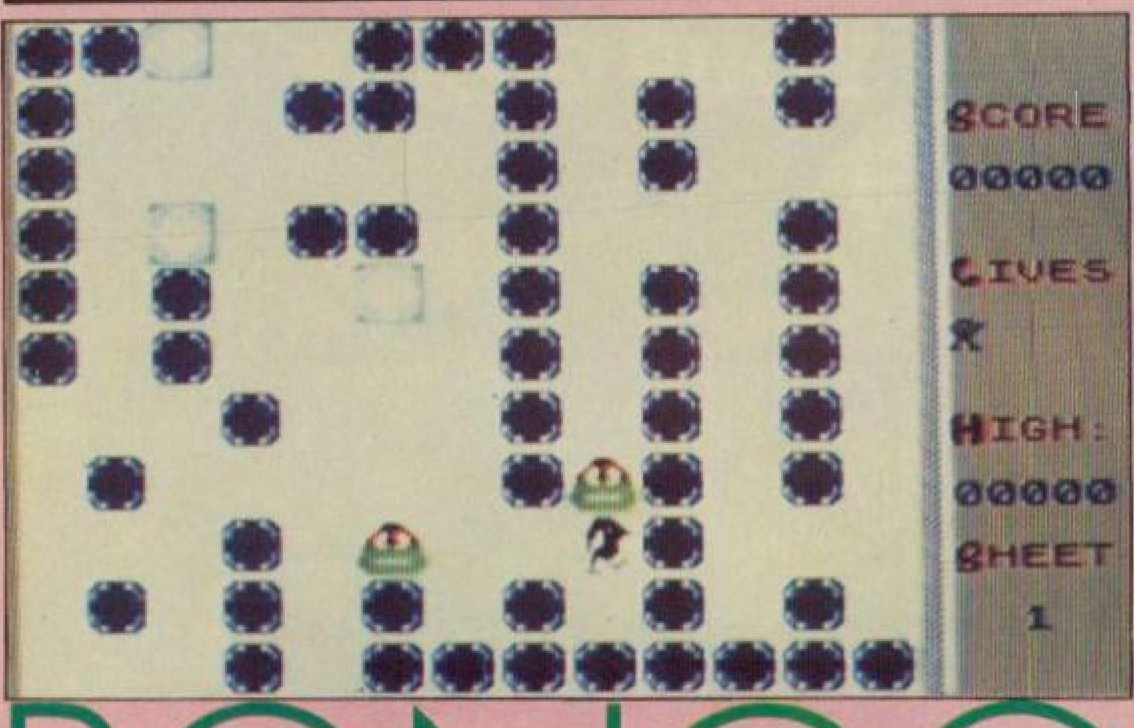


TRADE ENQUIRIES WELCOME

Most items are available from W H Smith, Boots, Spectrum Computer Centres and good computing shops or direct from:



Unit 30 Singer Way, Woburn Road Industrial Estate, Kempston, Bedford, MK42 7AF. Tel: (0234) 856633 Telex: 826078 KEMPMI G



PONGO

J. Ward and A. Neve try to avoid the snow bees with a Spectrum.

PONGO THE PENGUIN must be guided around the ice mazes and try to make a row of three diamond blocks.

Pongo can kill the chasing snow-bees by squashing them with the ice-blocks; use 0.

If both Pongo and a snow-bee are against the right hand wall then Pongo can stun the bee by pushing against the wall. When stunned Pongo can kill the bees by passing over them.

While hatching, the snow-bees can also be

```
   0>REM       PONGO
        BY J.WARD & A.NEVE
             K1983
   1 OVER 0: POKE 23658,8
   2 BORDER 0: PAPER 0: INK 7: B
RIGHT 1: RESTORE
   3 CLEAR 49999: PRINT AT 10,10
; FLASH 1;"PLEASE WAIT": GO SUB
9000: LET Z=USR (USR "E"+4): CLS

   4 RESTORE 9000: CLS : POKE 23
607,251: POKE 23606,89
   5 FOR F=65039 TO 65361: READ
A: POKE F,A: NEXT F
  10 LET HI=0: GO SUB 9700
  15 LET FRE=1: LET LIVES=3: LET
 SC=0: LET SHEET=1
  16 RESTORE 9200+(20*INT (RND*5
))
  17 BORDER 7: INPUT 1: PAPER 7:
 BRIGHT 1: INK 1
  19 LET A$="abababababababababa
bababab}": LET B$="cdcdcdcdcdcdc
dcdcdcdcdcd}"
  20 PRINT AT 0,0;: FOR F=0 TO 2
1 STEP 2: BEEP .01,F: BEEP .01,1
0: BEEP .01,-F
  30 PRINT INK 1;A$; INK 0; BRIG
HT 0; INK 1; BRIGHT 1;B$; BRIGHT
 0; INK 0;
  40 NEXT F
  50 INK 0
  60 READ A: FOR F=1 TO A
  70 READ X,Y,Z
  80 FOR N=X TO Y STEP 2
  90 PRINT AT N,Z;"  ";AT N+1,Z;
"  ": NEXT N
 100 NEXT F
 110 READ A: FOR F=1 TO A: READ
X,Y: PRINT AT X,Y;"  ";AT X+1,Y;
"  ": NEXT F
 120 FOR F=1 TO 3: READ X,Y: PRI
NT INK 5; FLASH 1;AT X,Y;"ab";AT
 X+1,Y;"cd": NEXT F
 130 LET H$="00000": PRINT BRIGH
T 0; INK 2;AT 3,27;"_CORE";AT 8,
27;"+IVES";AT 13,27;"IIGH:";AT 1
7,27;"_HEET": INK 0;AT 5,27;H$;A
T 15,27;H$;AT 10,27;"£££££"( TO
LIVES)
 140 LET H$=STR$ HI: LET BON=1:
LET TIME=INT (RND*SHEET*5)+2: PR
INT AT 19,29; BRIGHT 0;SHEET: PO
KE 23673,0: LET BR1=0: LET BR2=0
: LET KILLS=0: POKE 23673,0
 150 LET A=10: LET B=12
 151 IF ATTR (A,B)=253 THEN LET
A=A+2: IF ATTR (A,B)=253 THEN GO
 TO 151
 155 GO SUB 9995: GO SUB 9997
 160 LET G=2
 170 PRINT AT C1,D1;"  ";AT C1+1
,D1;"  ";AT C,D; FLASH (NOT NOT
LI1); INK 2;"ef";AT C+1,D; INK 4
;"gh"; FLASH 0;AT E1,F1;"  ";AT
E1+1,F1;"  ";AT E,F; FLASH (NOT
NOT LI2); INK 2;"ef";AT E+1,F; I
NK 4;"gh"
 172 IF BI1 THEN PRINT AT C,D; I
NK 1;"ab";AT C+1,D;"cd"
 173 IF BI2 THEN PRINT AT E,F; I
NK 1;"ab";AT E+1,F;"cd"
 175 IF KILLS>=TIME THEN GO TO 7
100
 180 IF A=C THEN IF B=D THEN IF
LI1+BI1 THEN POKE 65419,0: POKE
65421,7: GO SUB 9900: LET SC=SC+
10: LET KILLS=KILLS+1: GO SUB 99
95
 185 IF A=E THEN IF B=F THEN IF
LI2+BI2 THEN POKE 65419,0: POKE
65421,7: GO SUB 9900: LET KILLS=
KILLS+1: LET SC=SC+10: GO SUB 99
97
 190 IF A=C THEN IF B=D THEN IF
NOT LI1 THEN GO SUB 2000
 195 IF A=E THEN IF B=F THEN IF
NOT LI2 THEN GO SUB 2000
 200 LET A$=INKEY$: IF A$="6" TH
EN LET G=2: LET AT=ATTR (A+2,B):
 IF AT<>121 THEN IF AT<>253 THEN
 IF A<20 THEN PRINT AT A+1,B;"
";AT A,B;"  ": LET A=A+2
 210 IF A$="7" THEN LET G=3: LET
 AT=ATTR (A-1,B): IF AT<>121 THE
N IF AT<>253 THEN IF A>0 THEN PR
INT AT A+1,B;"  ";AT A,B;"  ": L
ET A=A-2
 220 IF A$="8" THEN LET G=4: LET
 AT=ATTR (A,B+2): IF AT<>121 THE
N IF AT<>253 THEN IF B<24 THEN P
RINT AT A+1,B;"  ";AT A,B;"  ":
LET B=B+2
 230 IF A$="5" THEN LET G=1: LET
 AT=ATTR (A,B-1): IF AT<>121 THE
N IF AT<>253 THEN IF B>0 THEN PR
INT AT A+1,B;"  ";AT A,B;"  ": L
ET B=B-2
 235 LET PUSH=(IN 61438)/2=INT (
IN 61438/2)
 240 IF G=1 THEN PRINT AT A,B;"n
m";AT A+1,B;"po": IF PUSH THEN L
ET AT=ATTR (A,B-2): IF AT=121 OR
 AT=253 THEN GO SUB 3000
 250 IF G=2 THEN PRINT AT A,B;"u
v";AT A+1,B;"wx": IF PUSH THEN
 LET AT=ATTR (A+2,B): IF AT=121
OR AT=253 THEN GO SUB 6000
 260 IF G=3 THEN PRINT AT A,B;"q
r";AT A+1,B;"st": IF PUSH THEN L
ET AT=ATTR (A-1,B): IF AT=121 OR
 AT=253 THEN GO SUB 5000
 270 IF G=4 THEN PRINT AT A,B;"i
j";AT A+1,B;"kl": IF PUSH THEN L
ET AT=ATTR (A,B+2): IF AT=121 OR
 AT=253 THEN GO SUB 4000
 290 IF SC>HI THEN LET HI=SC: LE
T H$=STR$ HI
 295 LET S$=STR$ SC: IF LEN S$>5
 THEN GO TO 7000
 300 PRINT AT 5,32-LEN S$; BRIGH
T 0;S$;AT 15,32-LEN H$;HI
 305 IF BI1 THEN LET BI1=BI1-1
 310 IF BI2 THEN LET BI2=BI2-1
 320 IF LI1 THEN LET LI1=LI1-1
 330 IF LI2 THEN LET LI2=LI2-1
 390 IF BR1 THEN LET BR1=BR1-1
 400 IF BR2 THEN LET BR2=BR2-1
 410 IF NOT LI1+BR1+BI1 THEN LET
 C1=C: LET D1=D: LET C=C+2*((C<A
)-(C>A) AND RND>.6): LET D=D+2*(
(D<B)-(D>B) AND RND>.6): IF ATTR
 (C,D)=121 THEN PRINT OVER 1;AT
C,D; INK 2;"\/";AT C+1,D;"/\": B
EEP .1,-40: LET BR1=3
 415 IF ATTR (C,D)=253 THEN LET
C=C1: LET D=D1
 420 IF NOT LI2+BR2+BI2 THEN LET
 E1=E: LET F1=F: LET E=E+2*((E<A
)-(E>A) AND RND>.6): LET F=F+2*(
(F<B)-(F>B) AND RND>.6): IF ATTR
 (E,F)=121 THEN PRINT OVER 1;AT
E,F; INK 2;"\/";AT E+1,F;"/\": B
EEP .1,-40: LET BR2=3
 425 IF ATTR (E,F)=253 THEN LET
E=E1: LET F=F1
 500 IF SC>9999 THEN IF LIVES<5
THEN IF FRE THEN LET LIVES=LIVES
+1: LET FRE=NOT FRE: BEEP .1,40:
 BEEP .1,40: BEEP .2,40: PRINT A
T 10,LIVES+26; FLASH 1;"£": FOR
Z=1 TO 50: BEEP .003,Z: NEXT Z:
PRINT AT 10,LIVES+26; BRIGHT 0;"
£"
1000 GO TO 170
2000 BEEP .5,-40: PRINT AT 10,LI
VES+26; BRIGHT 0;" "; BRIGHT 1;
INK 3;AT A,B;"yz";AT A+1,B;"к0":
#1;TAB 10;"TUFF LUCK"
2005 LET L=USR (USR "B"+4): FOR
L=127 TO 7 STEP -8: BEEP .1,L/2:
 POKE 22528,L: LET P=USR USR "A"
: NEXT L: LET L=USR USR "D": BEE
P .5,-20: LET LIVES=LIVES-1: INP
UT 1: IF LIVES<1 THEN GO SUB 720
0
2010 PRINT AT C,D;#1;"  READY W
HEN YOU ARE": PAUSE 0: PRINT AT
C,D;"  ";AT C+1,D;"  ";AT E,F;"
  ";AT E+1,F;"  ": INPUT 1: GO TO
 150
3000 IF ATTR (A,B-4)=121 OR ATTR
 (A,B-4)=253 OR B=2 THEN IF AT<>
253 THEN BEEP .2,30: PRINT AT A,
B-2;"dc";AT A+1,B-2;"ba": BEEP .
1,40: PRINT AT A,B-2;"  ";AT A+1
,B-2;"  ": LET SC=SC+1: RETURN
3001 LET X=B
3005 IF A=C THEN IF X=D THEN LET
 D=D-2
3006 IF A=E THEN IF X=F THEN LET
 F=F-2
3009 LET X=X-2
3010 LET AT=(ATTR (A,X+2)=253):
IF ATTR (A,X)<>121 THEN IF ATTR
(A,X)<>253 THEN IF X>=0 THEN PRI
NT AT A,X; INK 1+4*AT; FLASH AT;
"ab";AT A+1,X;"cd": PRINT AT A,X
+2;"  ";AT A+1,X+2;"  "
3016 IF NOT X OR ATTR (A,X-2)=12
1 OR ATTR (A,X-2)=253 THEN GO TO
 3060
3050 GO TO 3005
3060 IF A=E THEN IF X=F THEN LET
 KILLS=KILLS+1: PRINT AT E,F;("{
 " AND G=1)+(" {" AND G=4);AT E+
1,F;("| " AND G=1)+(" |" AND G=4
): BEEP .5,10: LET Z=USR USR "G"
: PRINT INK 1+4*AT; FLASH AT;AT
E,F;"ab";AT E+1,F;"cd": LET SC=S
C+50: GO SUB 9997
3070 IF A=C THEN IF X=D THEN LET
 KILLS=KILLS+1: PRINT AT C,D;("{
 " AND G=1)+(" {" AND G=4);AT C+
1,D;("| " AND G=1)+(" |" AND G=4
): BEEP .5,10: LET Z=USR USR "G"
: PRINT INK 1+4*AT; FLASH AT;AT
C,D;"ab";AT C+1,D;"cd": LET SC=S
C+50: GO SUB 9995
3080 IF AT THEN IF BON THEN LET
A1=A: LET B1=X: GO SUB 7500
3100 RETURN
4000 IF B=24 THEN GO TO 9500
4002 IF ATTR (A,B+4)=121 OR ATTR
 (A,B+4)=253 THEN IF AT<>253 THE
N BEEP .2,30: PRINT AT A,B+2;"dc
";AT A+1,B+2;"ba": BEEP .1,40: P
RINT AT A,B+2;"  ";AT A+1,B+2;"
  ": LET SC=SC+1: RETURN
4004 LET X=B
4005 IF A=C THEN IF X=D THEN LET
 D=D+2
4006 IF A=E THEN IF X=F THEN LET
 F=F+2
4009 LET X=X+2
4010 LET AT=(ATTR (A,X-2)=253):
IF ATTR (A,X)<>121 THEN IF ATTR
(A,X)<>253 THEN PRINT AT A,X; IN
K 1+4*AT; FLASH AT;"ab";AT A+1,X
;"cd": PRINT AT A,X-2;"  ";AT A+
1,X-2;"  "
4020 IF ATTR (A,X+2)=121 OR ATTR
 (A,X+2)=253 THEN GO TO 3060
4050 GO TO 4005
5000 IF ATTR (A-4,B)=121 OR ATTR
 (A-4,B)=253 OR A=2 THEN IF AT<>
253 THEN BEEP .2,30: PRINT AT A-
2,B;"dc";AT A-1,B;"ba": BEEP .1,
40: PRINT AT A-2,B;"  ";AT A-1,B
```

killed by being pushed.

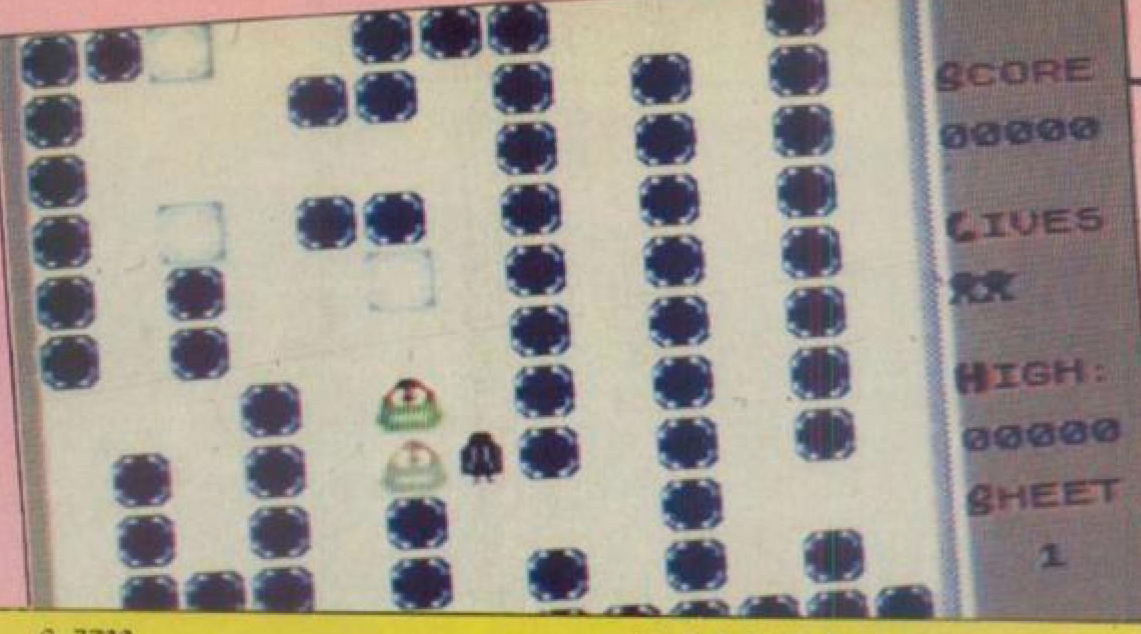
There are six machine-code routines in this game. The first transfers data from ROM into high-memory. The next four handle the screen and the last is used for sound affects.

Poke 65418 with PITCH
65419 with SPAN
65421 with DURATION
65440 with 28 for up or 29 for down.

The sound routine is called by:

PRINT USR USR "G".

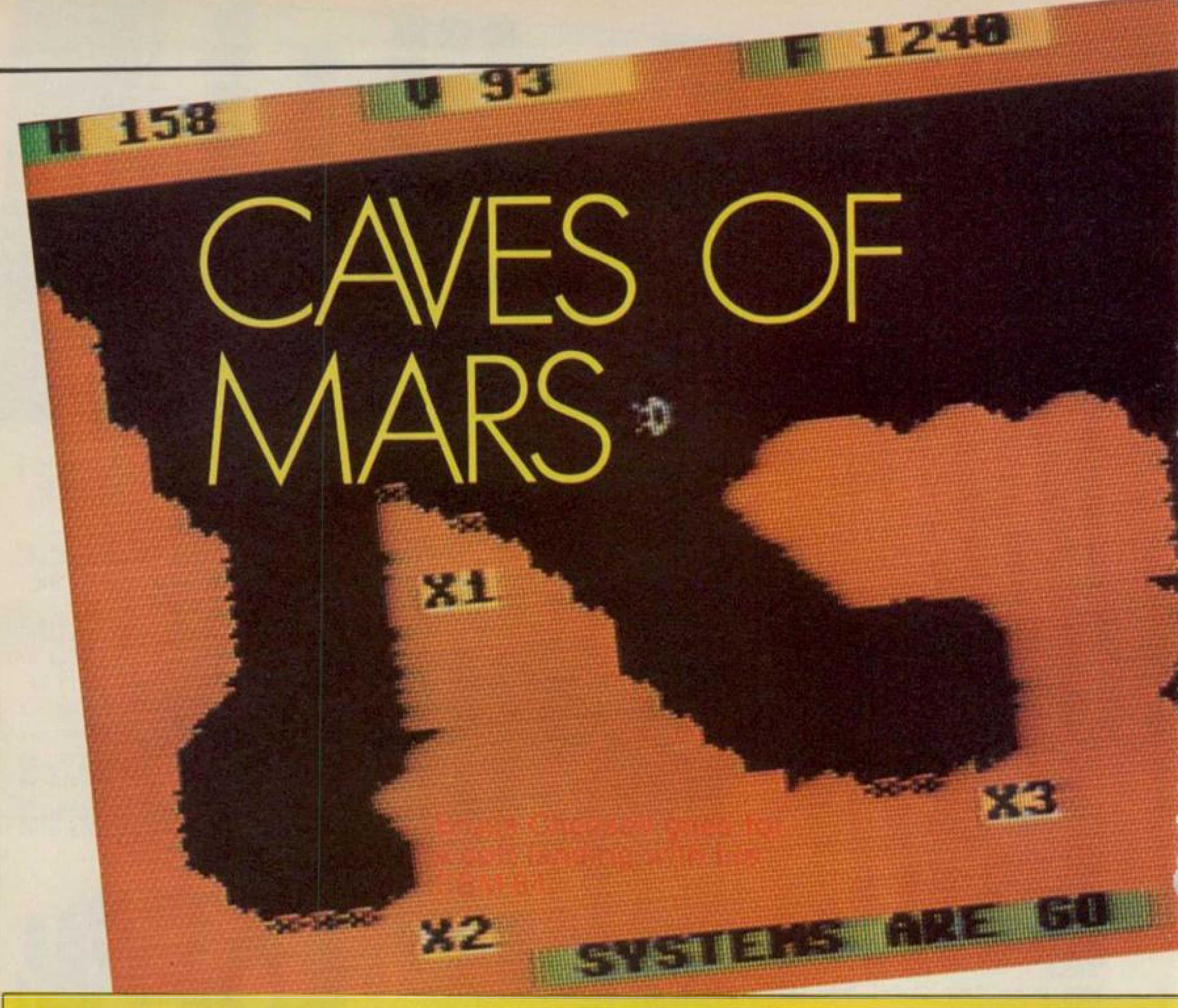
Pongo is available on cassette for those who rather not write it in from the listing. It is available from: Ultream Software, 1 Beaconstone, Beacon Road, Crowborough, East Sussex, TN6 1AZ.




```
;" ": LET SC=SC+1: RETURN
5004 LET X=A
5005 IF X=C THEN IF B=D THEN LET
 C=C-2
5006 IF X=E THEN IF B=F THEN LET
 E=E-2
5009 LET X=X-2
5010 LET AT=(ATTR (X+2,B)=253):
IF ATTR (X,B)<>121 THEN IF ATTR
(X,B)<>253 THEN IF X>=0 THEN PRI
NT AT X,B; INK 1+4*AT; FLASH AT;
"ab";AT X+1,B;"cd": PRINT AT X+2
,B;" ";AT X+3,B;"  "
5020 IF X=0 OR ATTR (X-2,B)=253
OR ATTR (X-2,B)=121 THEN GO TO 5
060
5050 GO TO 5005
5060 IF X=C THEN IF B=D THEN LET
 KILLS=KILLS+1: PRINT AT C,D;("
 " AND G=2)+("yz" AND G=3);AT C+
1,D;("yz" AND G=2)+("  " AND G=3
): BEEP .5,10: LET Z=USR USR "G"
: PRINT INK 1+4*AT; FLASH AT;AT
C,D;"ab";AT C+1,D;"cd": LET SC=S
C+50: GO SUB 9995
5070 IF X=E THEN IF B=F THEN LET
 KILLS=KILLS+1: PRINT AT E,F;("
 " AND G=2)+("yz" AND G=3);AT E+
1,F;("yz" AND G=2)+("  " AND G=3
): BEEP .5,10: LET Z=USR USR "G"
: PRINT INK 1+4*AT; FLASH AT;AT
E,F;"ab";AT E+1,F;"cd": LET SC=S
C+50: GO SUB 9997
5080 IF AT THEN IF BON THEN LET
A1=X: LET B1=B: GO SUB 7500
5100 RETURN
6000 IF ATTR (A+4,B)=121 OR ATTR
 (A+4,B)=253 OR A=18 THEN IF AT
>253 THEN BEEP .2,30: PRINT AT A
+2,B;"dc";AT A+3,B;"ba": BEEP .1
,40: PRINT AT A+2,B;"  ";AT A+3,
B;"  ": LET SC=SC+1: RETURN
6004 LET X=A
6005 IF X=C THEN IF B=D THEN LET
 C=C+2
6006 IF X=E THEN IF B=F THEN LET
 E=E+2
6009 LET X=X+2
6010 LET AT=(ATTR (X-2,B)=253):
IF ATTR (X,B)<>121 THEN IF ATTR
(X,B)<>253 THEN PRINT AT X,B; IN
K 1+4*AT; FLASH AT;"ab";AT X+1,B
;"cd": PRINT AT X-1,B;"  ";AT X-
2,B;"  "
6015 IF X=20 OR ATTR (X+2,B)=121
 OR ATTR (X+2,B)=253 THEN GO TO
5060
6050 GO TO 6005
7000 CLS : PRINT AT 10,10;"OK YO
U WIN": BEEP 1,-40: BEEP .1,30:
PRINT USR 0
7100 FOR X=1 TO 2: PRINT AT C,D;
"\/";AT C+1,D;"/\";AT E,F;"\/";A
T E+1,F;"/\": BEEP .1,10: OVER 1
: NEXT X: OVER 0: CLS : PRINT AT
 10,10;"WELL DONE";TAB 10;"NEW S
HEET": LET SHEET=SHEET+1: LET B=
PEEK 23673
7110 FOR X=1 TO 15: BEEP .02,13:
 BEEP .02,39: NEXT X: PRINT AT 1
7,10;INT (B/12);" MINUTE"+("S" A
ND INT (B/12)<>1);TAB 10;5*(B-12
*(INT (B/12)));" SECONDS": LET B
=260-B: PRINT TAB 10;"BONUS=";B:
 LET SC=SC+B: BEEP .2,20: BEEP .
3,30: GO TO 16
7200 PRINT AT 10,7; FLASH 1;" GA
ME OVER ": POKE 65440,29: POKE 6
5421,100: POKE 65419,200: LET Z=
USR USR "G": POKE 65440,28: POKE
 65421,2: POKE 65419,100: PRINT
AT 10,7; FLASH 1; INK 2; PAPER 6
;"ANOTHER GO ?"
7210 LET Z=USR USR "G": LET A$=I
NKEY$: IF A$="Y" THEN : GO SUB 9
900: GO TO 15
7220 IF A$="N" THEN PRINT USR 0
7230 GO TO 7210
7500 REM  DIAMOND ALLIGNMENT
7520 LET U=ATTR (A1+2,B1)=253
7530 LET X=A1>0 AND ATTR (A1-2,B
1)=253
7540 LET Y=ATTR (A1,B1+2)=253
7550 LET Z=B1>0 AND ATTR (A1,B1-
2)=253
7560 IF X THEN IF (U OR (ATTR (A
1-4,B1)=253 AND A1>2)) THEN GO T
O 7700
7570 IF U THEN IF ATTR (A1+4,B1)
=253 THEN GO TO 7700
7580 IF Z THEN IF (Y OR (ATTR (A
1,B1-4)=253 AND B1>2)) THEN GO T
O 7700
7590 IF Y THEN IF ATTR (A1,B1+4)
=253 THEN GO TO 7700
7600 RETURN
7700 BEEP .5,40: BEEP .4,50: LET
 BON=10*(INT (RND*100)): LET LI1
=15: LET LI2=15
7710 LET Y=USR (USR "B"+4): FOR
Y=0 TO 127: BEEP .003,Y/2: POKE
22528,Y: LET L=USR USR "A": NEXT
 Y: LET L=USR USR "D"
7720 FOR Y=BON TO 0 STEP -10: PR
INT AT 10,9;"BONUS ";Y;"  ": LET
 SC=SC+10: LET S$=STR$ SC: PRINT
 AT 5,32-LEN S$; BRIGHT 0;S$;AT
15,32-LEN S$;(S$ AND SC>HI): BEE
P .02,20
7725 NEXT Y
7730 LET L=USR USR "D": LET BON=
0: RETURN
8020 RESTORE 8000: FOR F=USR "A"
 TO USR "K"+7
8030 READ A
8040 POKE F,A
8050 NEXT F
8060 RETURN
8100 DATA 33,0,88,17,1,88,1,0,3,
237,176,201
8110 DATA 17,80,195,33,0,64,1,0,
27,237,176,201
8120 DATA 33,80,195,17,0,64,1,0,
27,237,176,201
8130 DATA 33,0,61,17,89,252,1,0,
2,237,176,201
8140 DATA 243,17,200,100,38,10,5
8,72,92,31,31,31,14,254,238,15,2
37,121,67,16,254,37,32,244,28,21
,32,232,251,201
8150 DATA 0,0,60,66,189,161,161,
189,66,60
9000 DATA 102,231,231,255,255,23
1,231,102
9010 DATA 56,120,112,96,96,102,6
3,30,28,54,98,102,120,190,70,124
,56,68,170,124,56,40,68,198
9020 DATA 0,31,51,111,95,95,127,
127,0,248,204,246,250,250,254,25
4,127,127,95,95,111,51,31,0,254,
254,250,250,246,204,248,0
9030 DATA 0,0,3,7,15,25,49,51,0,
0,192,224,240,152,140,204,121,12
7,127,255,240,255,127,63,158,254
,254,255,15,255,254,252
9050 DATA 0,3,7,7,15,12,12,8,0,1
92,224,240,184,254,240,224,9,11,
11,7,4,4,8,14,224,224,224,192,13
6,80,32,0
9060 DATA 0,192,224,224,240,48,4
8,16,0,3,7,15,29,127,15,7,144,20
8,208,224,32,32,16,112,7,7,7,3,1
7,10,4,0
9070 DATA 0,3,7,7,15,29,29,29,0,
192,224,224,240,184,184,184,29,2
7,27,31,23,2,6,0,184,216,216,248
,232,64,96,0
9080 DATA 0,3,5,6,10,22,23,23,0,
192,160,96,80,232,232,202,23,23,
23,31,23,2,5,0,232,232,232,248,2
32,64,96,0
9090 DATA 15,127,249,243,255,224
,127,15,224,128,159,207,255,7,25
4,224
9100 DATA 60,126,126,126,126,219
,219,219,255,191,153,229,126,126
,126,60
9110 DATA 168,84,168,84,168,84,1
68,84
9120 DATA 168,84,42,21,21,42,84,
168
9200 DATA 13,0,18,0,0,4,4,8,12,4
,16,20,4,0,4,8,3,15,3,4,8,10,0,4
,12,8,20,12,0,20,16,0,4,20,8,14,
20,2,18,24
9210 DATA 12,12,2,4,5,8,6,16,6,2
0,8,20,10,14,14,4,18,8,18,18,20,
10,22,18,22
9215 DATA 2,22,2,2,2,12
9220 DATA 7,2,13,2,8,15,6,10,13,
10,2,18,14,2,10,18,14,18,18,2,14
,22
9230 DATA 16,8,0,18,8,18,12,18,1
6,18,20,18,22,8,4,2,6,2,8,2,10,2
,12,8,8,6,10,6,12,8,16,10,22
9235 DATA 10,4,6,4,8,12
9240 DATA 11,0,18,2,0,4,6,4,12,8
,16,18,8,0,4,10,4,20,12,0,4,14,8
,16,18,0,4,16,16,18,18,0,18,22
9250 DATA 13,12,4,18,4,8,6,12,6,
16,6,16,10,4,12,8,14,20,14,4,16,
8,18,12,18,16,20
9255 DATA 4,18,2,16,18,18
9260 DATA 9,12,20,0,2,12,2,12,16
,4,0,8,6,8,20,8,2,18,12,0,18,16,
0,18,20,0,18,24
9270 DATA 3,20,2,20,4,4,6,4,10,0
,8,16,14,0,18,16,22
9275 DATA 0,4,6,4,8,10
9280 DATA 10,0,20,2,0,20,6,0,6,1
0,18,20,10,0,20,14,0,6,18,18,20,
18,6,14,22,0,4,24,18,20,24
9290 DATA 15,10,0,0,4,20,4,10,8,
14,8,10,10,10,12,14,12,10,18,14,
16,10,18,10,20,14,20,2,22,18,22
9295 DATA 3,4,12,4,10,18
9500 FOR N=0 TO 21: PRINT AT N,2
6; INK 0;"": NEXT N
9600 FOR N=0 TO 21: PRINT AT N,2
6; INK 1;">": NEXT N
9610 IF D=24 THEN LET LI1=10: PO
KE 65419,65: POKE 65421,10: POKE
 65440,28: BEEP .1,20: GO SUB 99
00
9620 IF F=24 THEN LET LI2=10: PO
KE 65419,65: POKE 65421,10: POKE
 65440,29: BEEP .1,20: GO SUB 99
00
9630 GO TO 180
9700 LET A$="
```

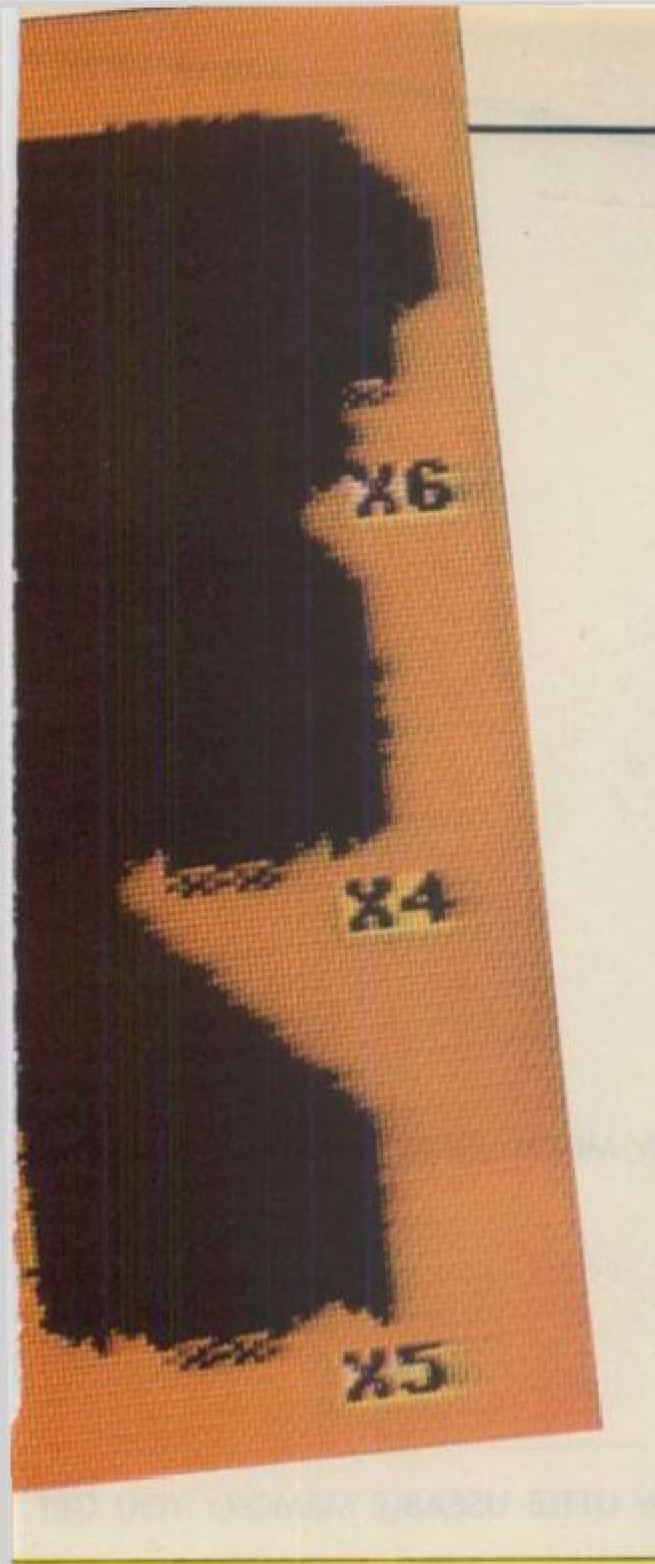
```
9710 FOR N=31 TO 2 STEP -1
9720 FOR F=0 TO 12 STEP 3: BEEP
.01,-F: PRINT AT F,N-2;"ef"; INK
 4;A$((32*F)+N);AT F+1,N-2; INK
7;"gh"; INK 4;A$((32*F)+N+32);AT
 F+2,N;A$((32*F)+64+N): NEXT F
9730 NEXT N
9740 FOR F=12 TO 0 STEP -3: FOR
N=F TO 15+(F/3): PRINT AT N,0;"
 ";AT N+1,0;"ef";AT N+2,0;"gh":
BEEP .01,N: NEXT N: BEEP .1,-10:
 PRINT AT N,0;"  ";AT N+1,0;"yz"
: NEXT F
9750 FOR F=0 TO 19: BEEP .01,19-
F: PRINT INK 5;AT F-1,0;"  ";AT
F,0;"ab";AT F+1,0;"cd": NEXT F
9760 LET B$=" PRESS ANY KEY TO P
LAY    ": FOR F=27 TO 2 STEP -1
: BEEP .01,F: BEEP .01,F+2: PRIN
T AT 20,F;"rs ";AT 21,F;"po ";B$
( TO 28-F): NEXT F
9770 PRINT AT 0,1;A$: PRINT AT 1
7,8;"BY JONATHAN WARD";AT 18,8;"
& ANDREW NEVE";AT 19,13;"K1983":
 FOR F=1 TO 10: PRINT OVER 1; IN
K 7;AT 0,1;A$: NEXT F
9780 PAUSE 1: PAUSE 0
9790 RETURN
9900 LET Z=USR USR "G": POKE 654
19,100: POKE 65421,10: POKE 6544
0,28: RETURN
9995 LET BI1=10: LET C=2*INT (RN
D*11): LET D=2*INT (RND*13): LET
 C1=C: LET D1=D: LET LI1=0: IF A
TTR (C,D)=253 OR (C=A AND D=B) T
HEN GO TO 9995
9996 RETURN
9997 LET BI2=10: LET E=2*INT (RN
D*11): LET F=2*INT (RND*13): LET
 E1=E: LET F1=F: LET LI2=0: IF A
TTR (E,F)=253 OR (E=A AND F=B) T
HEN GO TO 9997
9998 RETURN
```

CAVES OF MARS




```
100 PRINT"J" FORD=1TO1000:NEXT:PRINT
110 PRINT"████3  COMMODORE 64   CAVES OF MARS  ■"
120 PRINT"███████GRAPHICS FORMING UNDER PROGRAM                CONTROL":PRINT
130 PRINT"████PLEASE WAIT"
200 REM CHARACTER SET TO RAM - LOCATION 12288
210 PRINTCHR$(142)
220 POKE52,48:POKE56,48:CLR
230 POKE56334,PEEK(56334)AND254
240 POKE1,PEEK(1)AND251
250 FORI=0TO511:POKEI+12288,PEEK(I+53248):NEXT
260 FORI=1024TO1543:POKEI+12288,PEEK(I+53248):NEXT
270 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334)OR1
280 POKE53272,(PEEK(53272)AND240)OR12
300 REM GENERATE 26 NEW CHARACTERS - LOCATIONS 12504 AND 12760
310 FORI=1TO168:READX:POKE12503+I,X:NEXT
320 FORI=1TO40:READX:POKE12759+I,X:NEXT
330 DATA255,254,252,248,240,224,192,128,255,127,63,31,15,7,3,1
340 DATA0,1,3,7,15,31,63,127,0,128,192,224,240,248,252,254
350 DATA102,24,204,3,48,195,24,198
360 DATA0,0,0,0,0,0,0,0,156,222,123,91,91,123,222,156
370 DATA60,126,195,255,255,36,126,195,57,123,222,218,218,222,123,57
380 DATA1,3,6,12,12,6,3,1,195,102,48,24,0,0,0,0
390 DATA128,192,96,48,48,96,192,128,3,12,48,192,192,48,12,3
400 DATA195,195,102,102,60,60,24,24,192,48,12,3,3,12,48,192
410 DATA255,255,255,255,255,255,255,255,0,0,0,0,126,219,102,219
420 DATA0,3,55,63,127,255,255,255,195,24,3,124,60,6,224,27
430 DATA0,192,236,252,254,255,255,255,127,31,15,31,7,3,3,0
440 DATA255,255,255,255,255,255,255,216,255,255,127,127,127,255,255,127
450 DATA254,248,240,252,240,224,192,0,252,255,254,254,254,255,255,254
460 DATA51,204,48,230,3,120,6,100
470 DIMSC$(10),SC(10):FORX=1TO10:SC$(X)="::: ::: ::: :::":SC(X)=0:NEXTX
500 REM TITLE PAGE
510 PRINT"J" POKE53280,0:POKE53281,0:LO=0:MO=0:FL=0
520 PRINT:PRINT:PRINT"▪          J▪   ▪  J↑  ▪▪  ▪▪J▪   ▪J▪  ▪↑"
530 PRINT"          ▪▪    J££↑ ▪▪  ▪▪▪▪     ▪▪"
540 PRINT"          ▪▪    ▪▪  ▪▪▪▪  ▪▪▪   ▪ £▪  ▪↑"
550 PRINT"          ▪▪    ▪   ▪£↑J£ ▪▪         ▪▪"
560 PRINT"          £▪   ▪▪▪  ▪▪  ££  £▪   ▪£▪  ▪£"
570 PRINT:PRINT:PRINT"     J▪  ▪↑ J▪   ▪    J▪   ▪↑  J↑  J▪  ▪↑ J▪  ▪↑"
580 PRINT"     ▪▪  ▪▪▪▪        ▪▪▪▪▪▪▪J££↑ ▪▪  ▪▪▪▪"
590 PRINT"     ▪▪  ▪▪▪  ▪      ▪▪▪▪▪▪▪▪▪  ▪▪▪   ▪£ £▪  ▪↑"
600 PRINT"     ▪▪  ▪▪▪▪        ▪▪▪▪▪▪▪▪     ▪▪▪↑      ▪▪"
610 PRINT"     £▪  ▪£ ▪▪       ▪▪▪▪▪▪▪▪▪▪  ▪▪▪▪£↑ £▪  ▪£"
620 PRINT:PRINT:PRINT:PRINT:PRINT"▪          BY BRUCE CHESSELL 1983"
630 FORD=1TO5000:NEXT
700 REM INSTRUCTIONS
710 PRINT"J█████ MISSION INSTRUCTIONS ":PRINT:PRINT
720 PRINT"▪  YOU ARE IN CONTROL OF A MISSION TO":PRINT
730 PRINT"  LAND SUPPLIES INSIDE THE CAVES OF MARS":PRINT
740 PRINT"  LIMITED FUEL REPLENISHMENT IS":PRINT
750 PRINT"  AVAILABLE IF YOUR MODULE LANDS SAFELY":PRINT:PRINT
760 PRINT"  ▲ MODULE CONTROLS ":PRINT
770 PRINT"        DIRECTION    THRUST    ▪LANDING"
780 PRINT"                               AREAS"
790 PRINT"  ▪KEYS  X  C  V     F5 F7":PRINT
800 PRINT"      3I  ";CHR$(34);"  #    X  (       .**," :PRINT
810 PRINT"      ▪▪ HIT ANY KEY TO CONTINUE "
820 K=PEEK(197):IFK=64THENLO=LO+1:IFLO=700THENGOTO 4010
830 IFK<>64THEN850
840 GOTO820
850 PRINT"J████ SCORING "
860 PRINT:PRINT"▪  POINTS AND EXTRA FUEL GIVEN FOR EACH    SUCCESSFUL LANDING"
870 PRINT:PRINT"▪      VERTICAL     POINTS     EXTRA"
880 PRINT"       SPEED        GIVEN      FUEL"
890 PRINT:PRINT"▪       UNDER 5         300       100"
900 PRINT"        6 TO 9         200        50"
910 PRINT"       10 TO 20        100        20"
920 PRINT"       OVER  20    MODULE DESTROYED"
930 PRINT:PRINT"        POINTS AND FUEL ARE MULTIPLIED"
940 PRINT"       BY X FACTORS FOR LANDING AREAS"
950 PRINT:PRINT"███ DISPLAYED DURING FLIGHTS "
960 PRINT:PRINT"▪    H : HORIZONTAL SPEED   F : FUEL"
970 PRINT"                               LEFT"
980 PRINT"    V : VERTICAL SPEED"
990 PRINT:PRINT"          ▪▪ HIT ANY KEY TO START "
1000 REM START GAME
1010 K=PEEK(197):IFK=64THENMO=MO+1:IFMO=2000THENGOTO4010
1020 IFK<>64THEN1110
1030 GOTO1010
1100 REM SET MAIN VARIABLES
1110 F=2000:SC=0
1120 VX=36:VY=0:X=0:Y=3:SP=1104:J=SP:E=3:M=34:V=40:H=3:S=2:T=32:G=1.6
1200 REM SET SOUND REGISTERS
1210 VO=54296:W=54276:AD=54277:SR=54278:HF=54273:LF=54272
1220 GOSUB3010
1300 REM MODULE MOVEMENT LOOP - TO 1590
1310 K=PEEK(197):IFK=64THENA=0:B=0:D=32:POKEW,0:GOTO1460
1320 IFF<1THEN1420
1330 IFK=23THENM=33:E=1:V=-1:GOTO1400
1340 IFK=31THENM=35:E=2:V=1:GOTO1400
1350 IFK=20THENM=34:E=3:V=40:GOTO1400
1360 IFK=3THENS=2:H=3:GOTO1400
1370 IFK=6THENS=4:H=6:GOTO1410
1380 A=0:B=0:D=32:POKEW,0:GOTO1460
1390 REM JET SOUND
1400 IFS=2THENPOKEVO,7:POKEW,129:POKESR,240:POKEHF,212:POKELF,230
1410 IFS=4THENPOKEVO,14:POKEW,129:POKESR,240:POKEHF,26:POKELF,156
1420 IFE=1THENA=5:B=0
1430 IFE=2THENA=-5:B=0
1440 IFE=3THENA=0:B=-5
1450 D=M+H
1460 IFF>0THEN1490
1470 A=0:B=0:D=32:POKEW,0
1480 PRINT"████████████████████████████████J**************▪  OUT OF FUEL   ▪J********▪▪C▪
J▪▪▪";

1490 VX=VX+A:VY=VY+G+B
1500 X=X+VX+A/2:Y=Y+VY+(G+B)/2:F=F-(ABS(A)+ABS(B)):IFF<0THENF=0
1510 DX=INT(X/400):DY=INT(Y/400)
1520 N=SP:Z=J
```



MAKE AS MANY landings as possible inside the caves of Mars to provide the exploration parties with supplies. You have limited fuel so use it sparingly. Each successful landing gains points and extra fuel but select your landing areas carefully according to pilot skill and the amount of fuel you have left. The more difficult the landing area, the more points and fuel gained.

Remember that gravity alone will cause your downward speed to increase, which can only be reduced by expending precious fuel. Sideways speed will remain constant unless you alter this by using your thrusters. Module controls are:

Direction of Thrust
Key X — left
C — downward
V — right

Jet power
Key F5 — minimum
F7 — maximum

The softer the landing the more points scored and the more fuel taken on board, so keep your speed down at impact. Fine control is available using minimum jet power. Watch your speed dials closely and try to keep your touch down speed under 5. Anything over 20 at impact and your module is destroyed — but do not give up! As long as fuel remains you will be provided with another machine to fly.

The program contains full instructions and will auto start a demonstration routine if left to its own devices. However, you can take control at any time during the demonstration and the game will start after you land or crash!

This is an addictive game and as there is a scoreboard which records the names and points achieved by the 10 best players, it offers lots of opportunity to compete with your friends.

Although there are 26 special graphic characters created and used, the program is written entirely in Basic, so you might learn quite a lot from studying how it works. There are plenty of Rem statements to help you understand the logic.

The main sequences are as shown below:

Lines	
200-280	move two sections of ROM character set to RAM to enable the creation of new characters.
300-460	generates 26 new graphic characters.
470	sets up array of 10 highest scores.
500-620	provides title page.
700-990	provides game instructions.
1100-1210	sets main variables and sound registers.
1300-1590	module movement loop.
1600-1690	module landed or crashed assessment.
1700-1780	crashed module explosion and sound.
1800-1920	points and extra fuel assessment.
2000-2130	scoring routine.
2200-2320	display score table and start new game.
2400-2470	end game sequence to reset computer to normal graphics.
3000-3260	sub routine to create screen display.
4000-4040	sub routine to auto start game.

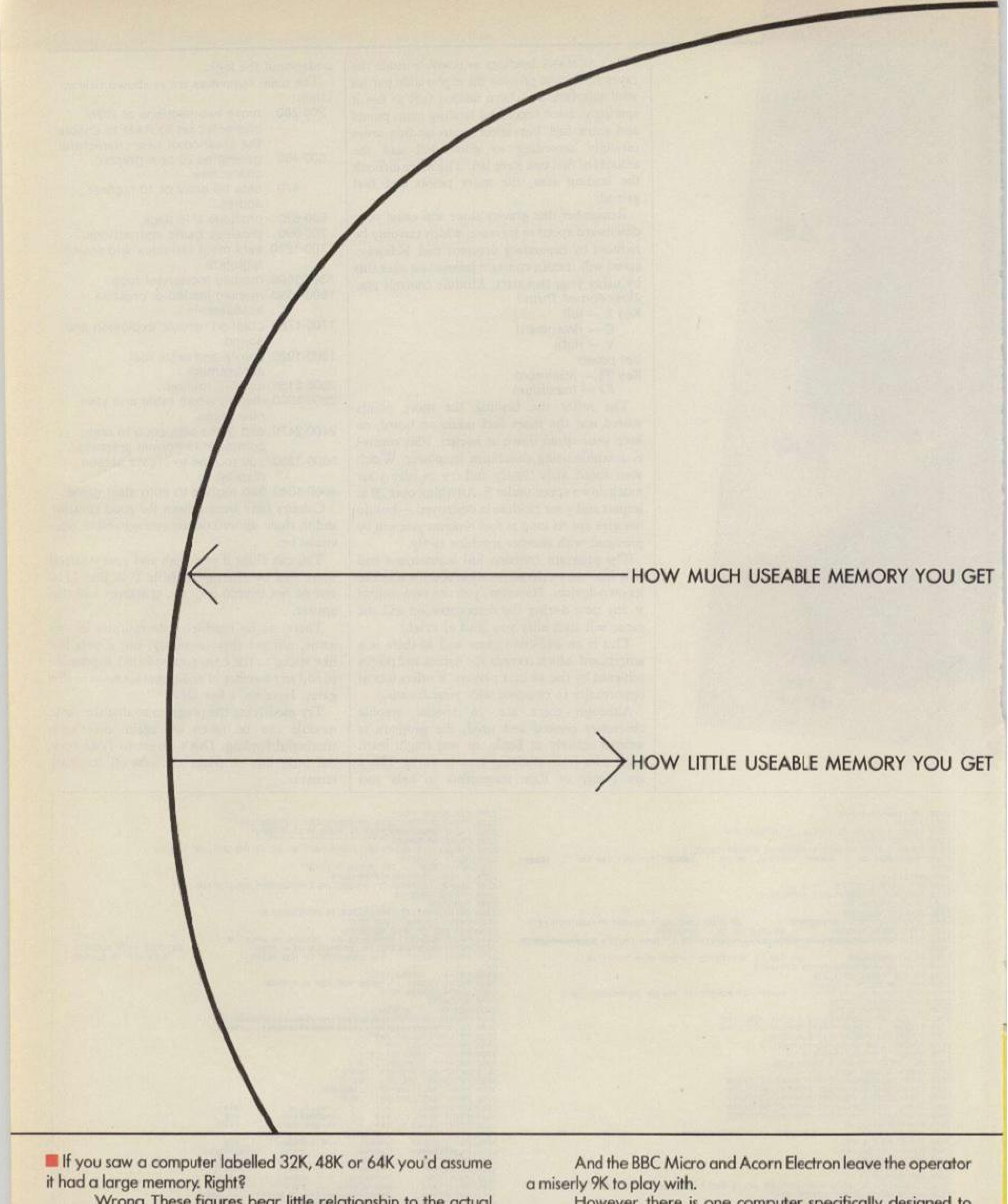
Colours have been chosen for good contrast and to show up well on the average colour television set.

You can cheat if you wish and give yourself more fuel by altering variable F in line 1110 but do not overdo it or the challenge will disappear.

There are no machine-code routines in this game, nor are they necessary, but if you feel like rising to the bait, you will find it possible to add any number of additional routines to this game. Here are a few ideas.

Try modifying the program so that the same module can be taken off again after each successful landing. Don't forget to Poke back the little bits of Mars the take-off jet blast removes.

```
1530 SP=1104+DX+DY*40
1540 J=SP+V
1550 POKEZ,T:POKEN,32:T=PEEK(J):U=PEEK(SP)
1560 IFU<>32THEN1610
1570 POKEJ,D:POKEJ+54272,8:POKESP,M:POKESP+54272,3
1580 PRINT"■■ HS      ■■■■■";INT(VX);"■ VS      ■■■■■";INT(VY);"■ FS      ■■■■■
■";F
1590 GOTO1310
1600 REM LANDED MODULE
1610 POKESP,M:POKESP+54272,3:POKEW,0
1620 IFU<>42THEN1660
1630 IFVY>20THEN1660
1640 IFVY<5THENPRINT"■■■■■■■■■■          ■ GOOD LANDING ":PO=300:PF=100:GOTO1810
1650 PRINT"■■■■■■■■■■■■          ■ LANDING OK ":GOTO1680
1660 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■■***************■ SYSTEMS FAILED ■■*********■■■
■***";
1670 PRINT"■■■■■■■■■          ■ MODULE DESTROYED ":PO=0:PF=0:GOTO1710
1680 IFVY<10THENPO=200:PF=50:GOTO1810
1690 PO=100:PF=20:GOTO1810
1700 REM EXPLOSION & SOUND
1710 FORX=15TO0STEP-1:POKEVO,X:POKEW,129:POKEAD,47:POKEHF,40:POKELF,200
1720 IFEX=1THENGOTO1750
1730 IFEX=2THENGOTO1760
1740 POKESP,45:POKESP+54272,1:EX=1:GOTO1770
1750 POKESP,31:POKESP+54272,2:EX=2:GOTO1770
1760 POKESP,63:POKESP+54272,4:EX=0
1770 FORS=1TO 50:NEXTS:NEXTX:POKEW,0
1780 POKESP,U:POKESP+54272,8
1800 REM CHECK POINTS & EXTRA FUEL
1810 FORD=1TO1000:NEXT
1820 IFSP<1304THENPO=PO*6:PF=PF*6:GOTO1880
1830 IFSP<1504THENPO=PO*1:PF=PF*1:GOTO1880
1840 IFSP<1624THENPO=PO*4:PF=PF*4:GOTO1880
1850 IFSP<1824THENPO=PO*3:PF=PF*3:GOTO1880
1860 IFSP<1904THENPO=PO*2:PF=PF*2:GOTO1880
1870 PO=PO*5:PF=PF*5
1880 PRINT"■■■■■■          ■ POINTS +";PO:PRINT"■■■■■          ■ FUEL   +";PF
1890 SC=SC+PO:F=F+PF
1900 FORD=1TO3000:NEXT
1910 IFFL=1THENRETURN
1920 IFF>0THEN1120
2000 REM SCORING
2010 FORN=1TO8:PRINT"■":FORD=1TO100:NEXTD:PRINT"■■■■■■■■ GAME OVER ":FORD=1TO200
2020 NEXTD:NEXTN:FORX=1TO2000:NEXT
2030 PRINT"■■■■■■■■■■■■■YOUR SCORE WAS   ";SC
2040 IFFL=1THENRETURN
2050 FORX=0TO20:GETA$:NEXTX:Z=0:FORX=1TO10:IFSC>SC(X)THENZ=X:X=11
2060 NEXTX:IFZ=0THEN2080
2070 IFZ>0THEN2090
2080 FORD=1TO8000:NEXT:GOTO2200
2090 PRINT"■■■■■■ENTER NAME FOR SCORE TABLE":POKE53272,21
2100 INPUT"■■■■■■■";A$:IFLEN(A$)>15THENA$=LEFT$(A$,15)
2110 IFZ=10THEN2130
2120 FORX=9TOZSTEP-1:SC(X+1)=SC(X):SC$(X+1)=SC$(X):NEXTX
2130 SC(Z)=SC:SC$(Z)=A$
2200 REM SCORE TABLE
2210 PRINT"■":POKE53272,20:POKE53280,1:POKE53281,7
2220 PRINT"■■■■■■■■■CAVES OF MARS BEST SCORES"
2230 PRINT"■■■■■■■■"
2240 FORX=1TO10:PRINT"■■";X;TAB(10);"■";SC(X);TAB(23);"■";SC$(X)
2250 NEXTX:X=FRE(0)
2260 PRINT"■■■     TRY AGAIN ? (Y/N)"
2270 K=PEEK(197):IFK=64THEN2270
2280 IFK=25THENPRINT"■":POKE53280,0:POKE53281,0:GOTO1110
2290 IFK=39THEN2310
2300 GOTO2270
2310 PRINTCHR$(147):POKE53280,14:POKE53281,6
2320 PRINT:FORD=1TO1000:NEXT
2400 REM END OF GAME SEQUENCE
2410 PRINT"■■■■■ COMMODORE 64   CAVES OF MARS  ■"
2420 PRINT"■■■■■■■■SPECIAL GRAPHICS HAVE BEEN                    REMOVED FROM MEMORY"
2430 PRINT:PRINT"    THE COMPUTER IS NOW BEING                         RESTORED TO SWITCH-
ON"
2440 PRINT"    CONDITION"
2450 PRINT:PRINT"    THANK YOU FOR PLAYING■"
2460 FORD=1TO5000:NEXT
2470 SYS64738
3000 REM SET UP SCREEN
3010 PRINT"■■****************************************";
3020 PRINT"************************************;;;****";
3030 PRINTSPC(36);" /**";
3040 PRINTSPC(38);"/*";
3050 PRINT";";SPC(38);"*";
3060 PRINT"*.";SPC(36);",*";
3070 PRINT"*>";SPC(35);"+**";
3080 PRINT"**";SPC(35);"<**";
3090 PRINT"**.";SPC(33);",■■K6■■*";
3100 PRINT"***";SPC(33);"/***";
3110 PRINT"***.     *         ,**,.*,.*,         ***";
3120 PRINT"****.    *,+      ,**********.        <**";
3130 PRINT"****>    <**.     /**********>        <**";
3140 PRINT"****>    *■■K1■■*.     /**********>        ***";
3150 PRINT"****>    <****.     /*;******>  ,++,,***";
3160 PRINT"****=    <*****          /****.  /***■■K4■■**";
3170 PRINT"***=     <*****.         *****   /******";
3180 PRINT"***      ,******.        <***=   /*****";
3190 PRINT"**>     ,********.       ****.    /****";
3200 PRINT"**>     /**********,.++,,****>     <***";
3210 PRINT"***.     ****************■■K3■■****     <***";
3220 PRINT"****,+++,********************>      ****";
3230 PRINT"*********■■K5■■**********************,.++,.****";
3240 PRINT"*************■ SYSTEMS ARE GO ■■********■■K2■■***";
3250 PRINT"****************************************";
3260 POKE2023,42:POKE56295,8:RETURN
4000 REM AUTO START
4010 FL=1:GOSUB1110
4020 PRINT"■"
4030 IFSC>0THENGOSUB2030:FORX=1TO3000:NEXT
4040 GOTO510
```



If you saw a computer labelled 32K, 48K or 64K you'd assume it had a large memory. Right?

Wrong. These figures bear little relationship to the actual amount of useable memory left once the computer is performing functions like text, colour, sound and even more importantly, high resolution graphics.

The Commodore, for instance, claims an "elephantine" 64K memory, yet uses up 26K producing high resolution graphics.

Under the same conditions, the Dragon 32K leaves 24K of useable memory, the Lynx 48K just 14K.

And the BBC Micro and Acorn Electron leave the operator a miserly 9K to play with.

However, there is one computer specifically designed to cope with these normal working functions as a matter of course.

The new Oric Atmos 48K.

Why, even when you add peripherals like the new micro disc drive unit and colour printer (see technical details overleaf), its useable memory is never less than a healthy 37K.

Which not only caters for all the standard applications you'd expect from any home computer, but also for advanced

WITH THE NEW ORIC ATMOS.

WITH OTHER HOME COMPUTERS.

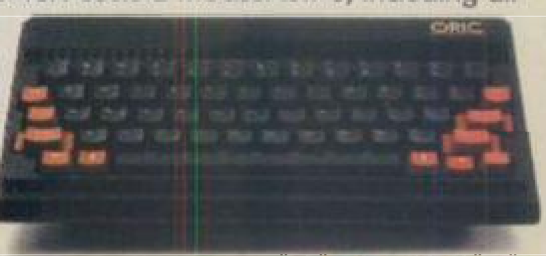
programming and very sophisticated games.

Talking of games, the new Oric Atmos starts off with a major advantage over most new computers, since it takes most of the software already written for the Oric-1.

And like the Oric-1, it has a powerful loudspeaker and amplifier inside its case.

The same unit, in fact, that prompted "Which Micro" (November) to quote…"At full volume this machine can compete with most arcade games. Its sound facilities have more in common with the £400 Beeb, than the rather pathetic beep of the Spectrum…"

Yet the Oric Atmos 48K costs a modest £170, including all the leads and adaptors you need to get it going.



But then what else would you expect from a British Company recognised for offering so much for so little?

The new Oric Atmos 48K.



Now we've whetted your appetite, here's something to get your teeth into.

Printer Technical Specifications

Printer/ Plotting system	Ball Point Pen, 4 colour
Plotting speed:	
(horizontal)	52 mm/sec (2.05ips)
(vertical)	73 mm/sec (3.08ips)
Printer Speed	12 characters per second
Resolution	0.2 mm/step (0.00787 inch)
Effective plotting range	96 mm (3.804 inch) x axis, divided into 480 steps. (No limit in y direction)
Characters per line	80 or 40 text mode (determined by software in graphics mode)
Characters per line	INT (480/n+1) *6) for 0=n=15
Accuracy	
(repetition)	0.2 mm max
(movement)	0.3 mm max
(distance)	0.5% max (x–axis) 1% (y–axis)
Pen life	250 metres (825 feet)
Parallel interface	8–bit parallel Uses STROBE and ACKNOWLEDGE
Temperature	
range	18.3 to 35°C (65 to 96°F)
storage	–40 to 71°C (.40 to 160°F)
Humidity range	10% to 80% relative non-condensing
Power supply	Switching power supply input 100–120 VAC 200–240 VAC
Dimensions	10¾" wide 6⅞" deep 2½" high

Atmos Technical Specifications

CPU	6502 A
Memory	Choice of 16K or 48K RAM
Memory (48K Model)	Minimum 48K RAM, max 64: 16K ROM external control signals allow use of full 64K RAM or maybe used externally to increase ROM/RAM
Language	Extended Microsoft basic
Keyboard	Typewriter style and pitch, 57 keys, standard computer layout, additional cursor control keys, autorepeat facility, tactile and acoustic feedback
Display	Output for B&W or colour TV, RGB output for colour monitor.
Text format	40 line x 28 rows
Character set	Similar to Teletext format, standard ASCII double height, flashing, 80 user definable characters
Graphics	240 x 200, 8 colours
Graphic Facilities	Points, lines, circles
Sound	Internal loudspeaker and amplifier. 3-Channel sound synthesiser envelope control, amplitude control 8 octaves, noise channel
Storage	Most cassette recorders via DIN socket 300 or 2400 BAUD. Disc Drive.
Interface	Centronics, expansion port, Hi-fi, RGB Monitor, UHF TV, cassette recorder
Other	Warm reset to regain control without clearing program or data

Micro Disc Technical Specifications

Formatted Capacity	160K bytes per side (double density as standard)
No. of Tracks	40 (80 available as option at a future date)
No. of Sectors	16
Bytes per Sector	256
Transfer Rate	250K Bits/Sec

Supports up to 599 files per side, four drives single or double sided, 40 or 80 track. User definable configuration allows mixing of drive types including 5 ¼" (five and a quarter inch)
Extensive wild card facilities
Copy allows merging of basic and machine code files

Utilities

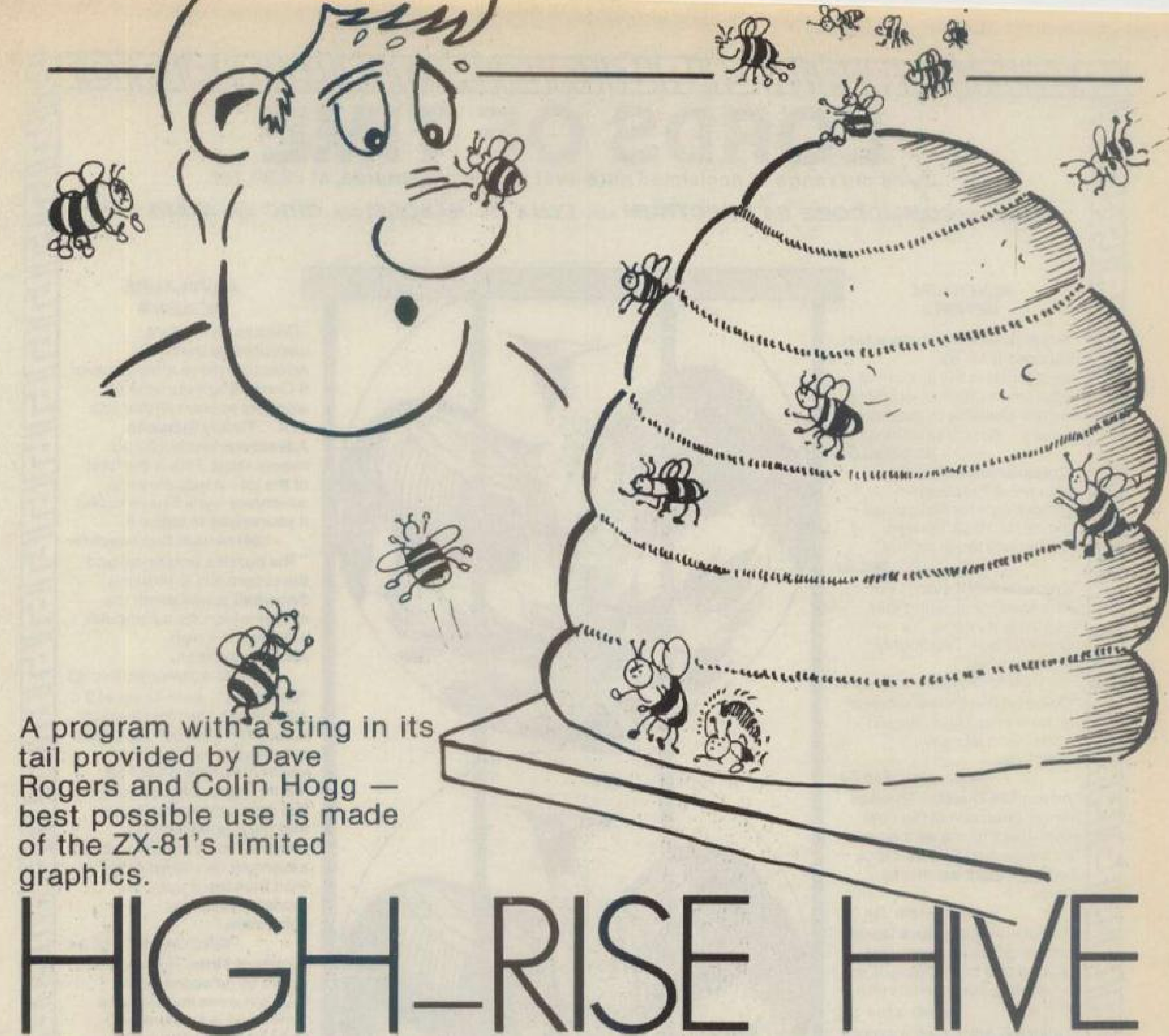
The Utilities are as follows:

1. Backup	Copy a whole disc
2. Copy	Copy a file to another
3. Del	Delete a file allowing wildcards
4. Dir	Display directory listing
5. Drv	Set the default drive number
6. Format	Format and initialise a disc
7. Load	Load a file (code data or basic)
8. Protect	Change protect status of file
9. Recall	Recall a basic array from a file
10. Ren	Rename a file
11. Save	Save a file (code, data or basic)
12. Store	Store a basic array as a data file
13. Sys	Change system configuration

Prices and data correct at time of going to press.
Specifications on the above models may change without notice.

Available at Allders, Currys, Dixons, Greens, Harrods, Laskys, Rumbelows, Spectrum and Zappo Computer Centres.





A program with a sting in its tail provided by Dave Rogers and Colin Hogg — best possible use is made of the ZX-81's limited graphics.

HIGH-RISE HIVE

FOR ANY ZX-81 owners who are feeling forgotten and unsupported, Hi-Rise-Hive provides a professional quality, fast, and addictive game, featuring progressive difficulty from easy to almost impossible and up to 20 independently roaming bees.

The player is also cast as a bee, but one that is trying to monopolise the honey by taking it from the cells of a multi-storey hive. The other bees of course, being the socially responsible creatures that they are, are busy, constantly refilling the empty cells, but are understandably peeved about having to do this and so will 'sting' you given the opportunity.

Behaviour is realistic

The movement alrorithm has been designed to make their behaviour as realistic as possible, for example if you are near one and sit still it may just go away, on the other hand one may decide to chase you quite a distance along a gallery, forcing you to jump off. Note that you can always jump off or slide down the outside of the hive but the only way *up* is via the internal ladders.

In fairness to Nature we wouldn't want to induce Apiaphobia in anybody, especially any younger readers, so don't forget that bees will not normally bother you if you don't bother them. If you are unlucky enough to encounter the subspecies 'Adansonii' this may not apply but fortunately this aggressive strain is not native to Britain.

The hive is almost five screens in size, one third of which is underground labyrinth. It is all held in *one* rather huge string, so you will only ever see a certain section at a time starting at the top, but those with ZX printers can cheat and see the whole lot simply by typing

LPRINT H$

If you can clear out every cell on a given screen then you proceed to the next section, the hive becoming wider and more and more bees appearing at each successive level. By the time you reach the underground section, the maximum of 20 bees will have been reached and the screen will be literally a hive of activity.

If you should manage to clear the final screen you then start at the top of the mega-hive, and we really do not envisage any player being able to clear more than a few screens of this — in the rare event of completing the mega-hive you will go on to an even wider mega-mega-hive and so on.

For variety, the layout of honey cells is random each game you play, but it is designed to tend towards more interesting structures. For example, there will often be clusters of cells where bees can enter, and by depositing 'honey' behind them, trap themselves in. These situations are of course somewhat dodgy to try and clear out since the entombed bee, although it *looks* dormant, is in fact bursting to get out! You may *have* to let it out sooner or later to clear the screen.

Crash can occur

Essential addresses in this program are:

Spare byte 16508 — This is used to store the character of whichever square the player next intends to move onto. It is used by *both* the Basic and the machine code, for replacing characters when the man moves (line 30) or is hit by a bee (hex 410F).

Spare byte 16417 — Holds the number of active bees, from zero up to 20. It is Poked by line 510 to vary the number of bees flying on different screens. Beware: a crash can occur if it is Poked much above 20.

USR 16514 — Sets up bees in their start positions at top of the screen.

USR 16546 — Moves each active bee on space, does 'screen cleared' scan and checks if player has been hit. Normally returns to Basic

(continued on page 105)

(continued from page 103)

with line number 10, but returns with line number 600 if the player has been hit, or with 300 if the screen has been cleared. The Basic then 'goes to' one of these lines.

USR 16749 — This routine is equivalent in Basic to:

Let score = score + 2
Print at 23, 15; score
Goto 50

It is however, much faster *and* it formats the printing with leading zeros to allow a rapid count-up visual effect. The score is held *only* on the screen, not in a variable, and screen positions (23,15) to (23,20) must start off as six zeros.

Listing includes hex loader

The main listing *includes* the hex loader, so type in all the Basic first, *not* forgetting the first four Rem lines as detailed below. Then Run 9000 and enter the Hex data one line at a time, including the check figures but not the spaces.

Line 1 must be typed in as Rem followed by *exactly 103 characters,* any will do. The line number of this is then edited to 2, 3 and 4 to produce four identical lines, making available a total of 432 bytes for the machine code. You only actually have to type in 280 of these via the hexloader, the remainder are left for use as 'stores' where the machine code routine will eventually hold information on individual 'bees'.

The self-checking hexloader given is as near foolproof as you can get, it simply will not let you enter wrong data or lines in the wrong order. The check figures consist of the sum of each line of hexdata plus 20 times the line number. It is statistically highly improbable that exactly equal-but-opposite errors would occur, cancel out, and admit incorrect data. When finished, the loader will remind you to tape a back-up copy of the program, in case it crashes when Run.

Once you are satisfied that the program is working properly the hexloader lines can be deleted and some final copies taped. Remember that the ZX-81 Saves its variables along with the program and H$ is rather a huge string to unnecessarily save on tape! So always use Goto 9990, as this includes a 'clear' before autosaving, reducing save/load time by over two minutes.



Importance of graphics

It is most important to realise the importance of the graphics characters used, particularly the greys. The grey on key A is Outside Grey in which bees are triggered to move diagonally for four moves — or until they hit something — then change direction, giving an erratic bee-in-flight motion. The player however will *fall* through outside grey until another object is hit. The grey on key H is Inside Grey and in this the bees are triggered to move horizontally and vertically so as to wander along the passageways. The player can move freely through inside grey.

(continued on next page)

Main variables

S	Screen position of player.
IP	Intended position (players next move).
DK	Deck level of hive (0 to 60).
MC	Machine code subroutine calls.
STGS	Strings (0 to 30).
H$	Hive string.
E$	Empty string — actually contains spaces and minuses.
SDF	Start of display file.
Hive construction variables.	
A$	Assembly string in which lines are built up before being added to hive string.
U$	Utility string. (general purpose).
TY	Type of line to be added e.g., honey cells, empty cells, passageway.
HW	Half-width (no, not half-wit!), determines slope to sides of hive. Increases with T and N so hive gets wider on successive levels.
K	Ladder positions.
G$ T$ B$	Used in construction of underground section.

Main listing.

```
   7 IF PEEK 16544<>238 THEN RUN
 9000
   8 RUN 9995
   9 REM -----MAIN LOOP-------->
  10 LET IP=S-(INKEY$>"W")+(INKE
Y$="C")+33*((INKEY$="N")-(INKEY$
="J"))
  20 IF PEEK IP<134 THEN GOTO
(70)+(30 AND PEEK IP=23)+(130 AN
D PEEK IP=8)
  30 POKE S,PEEK 16508
  40 POKE 16508,PEEK IP
  50 POKE IP,61
  60 LET S=IP
  70 GOTO USR 16546
 100 REM ----PICK-UP-HONEY----->
 110 POKE S,PEEK 16508
 120 POKE IP,189
 130 POKE 16508,137+(11 AND RND<
0.4)
 140 GOTO USR 16749
 200 REM -----FALL-OFF-LOOP---->
 210 POKE S,PEEK 16508
 220 LET MC=USR 16546
 230 POKE 16508,PEEK IP
 240 POKE IP,59
 250 LET S=IP
 260 LET IP=IP+33
 270 IF PEEK IP<10 THEN GOTO 210
 280 GOTO 20
 300 REM ----CLEARED-SCREEN---->
 310 LET U$="CLEARED,BONUS="+STR
$ (DK*4)+" PRESS ""P"" WHEN REA
DY FOR NEXT DECK        >>>>>>>"
 320 FOR N=1 TO 64 STEP 3
 330 PRINT AT 7,0;(U$( TO N)+E$+
E$)( TO 64)
 340 IF INKEY$<>"P" THEN NEXT N
 350 IF N>61 THEN GOTO 300
 360 FOR B=1 TO DK+DK
 370 LET MC=USR 16749
 380 NEXT B
 400 REM -----NEXT-DECK-------->
 410 IF DK>60 THEN GOSUB 4000
 420 FOR N=DK TO DK+7+RND*4
 430 PRINT AT 0,0;H$( N*32+1 TO
)( TO 704)
 440 NEXT N
 450 LET DK=N-1
 460 PRINT AT 22,0;"[redacted]";TAB 5;("0"
AND DK<10);DK
 470 FOR T=SDF+2 TO SDF+31
 480 IF PEEK T>8 THEN POKE T,173
 490 POKE SDF+743,61+RND
 500 NEXT T
 510 POKE 16417,4+DK/2+(16-DK/2
AND DK>32)
 520 LET MC=USR 16514
 530 LET S=SDF+743
 540 POKE 16508,152
 550 GOTO 10
 600 REM -----MAN-HIT/END------>
 610 FOR N=1 TO 12
 620 POKE S,CODE ".*X*.X*.X*.▚"(
N)
 630 PRINT AT 23,22+ABS (N-6.5)
;"SGNITSSTINGS"(N)
 640 NEXT N
 650 LET STGS=STGS+1
 660 PRINT AT 23,31-(STGS>9);STG
S
 670 IF STGS<30 THEN GOTO 530
 680 PRINT AT 1,0;E$+E$+(E$ AND
RND>.7);AT 1,7;"**---GAMEOVER---
**";AT 3,3;"PRESS ""P"" TO PLAY
AGAIN **>>"
 690 IF INKEY$<>"P" THEN GOTO
     680
 700 REM --------SET-UP-------->
 710 FAST
 720 LET S=0
 730 LET IP=0
 740 LET U$=""
 750 RAND
 760 LET H$=CHR$ 8
 770 FOR N=1 TO 8
 780 LET H$=H$+H$
 790 NEXT N
 800 FOR T=0 TO 3
 810 FOR N=2+(5 AND T>0) TO 21 S
```

(listing continued on next page)

(continued from previous page)

Please double-check the following lines:

870 Inside grey (key H)
940 Outside grey (key A)
950 Outside grey (key A)
9999 Outside grey (key A)
630 inverse word 'strings' (backwards!)
830 various combinations of *graphic shift G* and inverse spaces; "is, 2gg, 2is, gg, 3is, 4gg, 2is, 2gg, 3is, 3gg, 2is, gg, 2is"
890 inverse H's
950 'Outside' grey and inverse H

Check figure is sum of hex data plus 20 × line number.

HEX–DUMP								CHECK
2A	0C	40	11	E5	FF	19	EB	899
21	97	41	06	14	36	00	23	404
36	01	23	36	08	23	23	23	317
73	23	72	23	13	10	EE	C9	853
2A	0C	40	01	D6	02	3E	17	520
FD	A1	01	2C	01	C0	FD	7E	1151
21	21	97	41	11	3C	40	01	564
07	00	F5	C5	E5	D5	ED	B0	1464
CD	DB	40	E1	D1	C1	F1	ED	1773
B0	EB	3D	20	E7	01	0A	00	946
FD	CB	43	16	D0	01	50	02	1064
C9	FD	35	3D	CC	2A	41	FD	1372
7E	3E	2A	41	40	ED	4B	3F	994
40	77	09	7E	0E	80	FE	08	1002
28	28	FE	88	28	26	FE	89	1239
28	1C	FE	AD	28	1E	FE	3D	1200
28	0B	FE	76	28	22	2A	41	944
40	36	06	18	1B	FD	36	43	909
80	FD	7E	7C	18	06	3E	17	1126
18	02	0E	00	FD	77	3E	22	908
41	40	36	06	FD	71	3C	C9	1236
FD	36	3D	04	2A	32	40	E5	1197
D1	29	29	29	19	29	29	29	940
19	22	32	40	7C	FD	46	3C	1160
CB	10	38	17	21	DE	FF	17	1331
30	07	17	38	1A	2E	E0	18	974
18	21	06	00	17	CB	15	CB	1053
15	18	0C	17	ED	62	CB	C5	1375
17	38	04	7D	EE	20	6F	22	1203
3F	40	C9	06	02	0E	32	3E	1062
25	2A	0C	40	11	0C	03	19	832
BE	20	05	36	1C	2B	18	F8	1264
34	10	EE	3E	02	32	6E	41	1255
C9	FE	FE	AD	B4	AC	B7	B4	2277
AC	B5	B7	B4	AC	24	20	C9	1857

960 inverse H, three inverse spaces, graphic Shift V, three inverse spaces, graphic Shift V, three inverse spaces, graphic H.
980 graphic H's
992 six graphic Shift V's. Second string contains graphic H's and g. Shift V's.
1040 g. Shift H, three g. Shift F's, (4 g. Shift G, 4 g. Shift F) × 3, 3 g. Shift G, g. Shift H.
460 g. Shift V's.
Line 9999 *must* contain 32 letters, then 64 graphic shift A's.

Note trigger characters

Note that Colons (Shift Z) are used as *trigger* characters in lines 1070, 1090, 1130 and 1150, there should be six colons in total.

Line 10 The first check uses 'greater :han' but the rest use equals. This is to allow the use of either key 'Z' or key 'X' for 'left' so as



to be comfortable on both original and full size ZX-81 keyboards.

If you don't feel like typing the program in, the authors can supply a good quality taped version. Send £2.50 to: 1 Carnarvon Road, Walton, Liverpool L9 1EB. ■

```
9140 IF H$(N)>"F" THEN GOTO 9060
9150 LET X=16506+INT (N/2)+8*L
9160 POKE X,16*CODE H$(N)+ CODE
H$(N+1)-476
9170 LET SUM=SUM+PEEK X
9180 NEXT N
9190 IF STR$ (SUM+L*20)<> H$(17
TO ) THEN GOTO 9060
9200 IF L>1 THEN IF PEEK 16524<>
65 THEN PRINT "HEXLOADER TYPED I
N WRONG";UV
9210 NEXT L
9220 PRINT "OK.PRESS P WHEN READ
Y TO SAVE"
9230 GOTO 9230+(INKEY$="P")
9240 CLS
9990 REM -------AUTOSAVE-------->
9991 CLEAR
9992 SAVE "HRH"
J.DAVE ROGERS/COLIN HOGG/JAN 84
9993 PRINT "TURN TAPE OFF:PRESS
A KEY:WAIT"
9994 PAUSE 4E4
9995 FAST
9996 POKE 16420,100
9997 LIST 9990
9998 RUN 700
9999 REM THIS LINE IS ESSENTIAL-
UUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
4000 REM -------MEGA-HIVE------->
4010 LET DK=0
4020 LET A$=A$+"MEGA-"
4030 PRINT AT 7,0;"WELL DONE, YO
U REACHED THE END. PLEASE WAIT -
 FOR THE "+A$+"HIVE>"
4040 FOR N=1 TO (LEN H$-64) STEP
 32
4050 LET H$(N TO N+31)=CHR$ 173+
 H$(N+3 TO N+17)+H$(N+13 TO N+27
)+CHR$ 173
4060 NEXT N
4070 RETURN
9000 REM ----HEXLOADER,ETC----->
9010 IF PEEK 16944<>118 THEN PRI
NT "REMS WRONG LENGTH";UV
9020 POKE 16510,0
9030 POKE 16511,176
9040 POKE 16512,1
9050 FOR L=1 TO 35
9060 PRINT ,,"OK ENTER LINE ";L
9070 GOTO 9090
9080 PRINT "█████RETYPE LINE ";L
9090 INPUT H$
9100 CLS
9110 IF LEN H$<17 THEN GOTO 9060
9120 LET SUM=0
9130 FOR N=1 TO 16 STEP 2
9135 PRINT H$( TO N+1)
```

(listing continued from previous page)

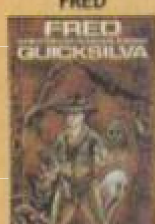
```
TEP 1+(T=0 OR T=2)
 820 LET TY=N-(5*INT (N/5))
 830 LET U$=("██████████████
███████████████" AND TY=4)+"
 840 IF TY-(T=0 OR T=2)=3 THEN L
ET U$="██*██*██*██*██*██*██*██
██*██*██"
 850 LET A$=H$( TO 32)
 860 LET HW=T+N/2
 870 LET A$(16-HW TO 16+HW)=("██
██████████████████████" AND TY=
2)+CHR$ 150+U$(1+RND*7 TO )( TO
HW+HW-1)+CHR$ 150
 880 LET K=15-N/5
 890 LET A$(K TO 33-K)="██"+A$(K
+2 TO 31-K)+"██"
 900 LET H$=H$+A$
 910 NEXT N
 920 NEXT T
 930 REM -----UNDERGROUND------>
 940 LET G$="██████"
 950 LET A$=G$+"██████████"+G$+"████
█████"+G$
 955 LET A$=A$+A$
 960 LET T$="█████████████"
 970 LET U$=T$+G$+T$
 980 LET B$="████████████████"
 990 FOR U=1 TO 4
 991 LET A$=A$+B$+(G$ AND RND>.4
)+B$+U$+U$+U$+B$
 992 LET A$ = A$+"██████████"+(B$ AN
D RND>.6)+"█*█*█*"+T$(7 TO )+G$+
T$( TO 7)+"*█*█*█"
 993 NEXT U
 994 LET A$=A$+A$(65 TO 481)
 995 LET H$=H$+A$
 996 LET A$=""
1000 REM -----INTRO/START----->
1010 POKE 16418,0
1020 LET E$="-  --  --  --  --
--  --  --  -"
1030 FOR N=0 TO 22
1040 PRINT AT N,0;"████████████
█████████████"+E$
1050 NEXT N
1060 PRINT AT 12,2;"*HOLD KEY P
";TAB 2;"FOR PREVIEW.";AT 10,7;"
OR";AT 16,2;"A";TAB 2;"█▀█";TAB
2;"█▄█OGROGPROG";AT 6,2;"*HIT AN
Y KEY";TAB 2;"TO SKIP PAST";TAB
2;"INSTRUCTIONS"
1070 LET U$=" HOW LONG CAN YOU S
URVIVE ? IN: ███████████████
█ ///// U.CAN.B.A.BUMBLE BUR
GLAR. MOVEMENT KEYS ARE: Z=LEFT
,C=RIGHT,N=DOWN,J=UP (KEY X ALS
O USABLE)"
1080 LET U$=U$+" > TAKE HONEY(*
) FROM THE CELLS,EACH IS WORTH 2
 POINTS.CLEARING A SCREEN GIVES
BONUS ███ LETS YOU GO DEEPER INT
O THE HIVE, EVENTUALLY TO THE UN
DERGROUND CHAMBERS.GAME OVER AFT
ER 30 STINGS"
1090 LET U$=E$+U$+":"+E$+":"
1100 SLOW
1110 FOR N=30 TO LEN U$
1120 PRINT AT 1,1;U$(N-29 TO N)
1130 IF U$(N)<>":" AND INKEY$=""
 THEN NEXT N
1140 IF N=LEN U$ THEN GOTO 1000
1150 IF U$(N)<>":" THEN GOTO
     2000
1160 FOR T=4 TO 20
1170 PRINT AT T,15; U$(N TO N+14
);AT 1,1;U$(N-29 TO N)
1180 LET N=N+1
1190 IF INKEY$="" THEN NEXT T
1200 NEXT N
2000 FOR N=1+(2240 AND INKEY$="P
") TO 1 STEP -32
2010 PRINT AT 0,0;H$(N TO N+703)
2020 NEXT N
2030 PRINT AT 23,0;"DECK:00  SCO
RE:000000  STINGS:00"
2040 LET DK=0
2050 LET STGS=0
2060 LET SDF=PEEK 16396+256*PEEK
     16397
2070 GOTO 460
```

HEROES APPLY WITHIN.



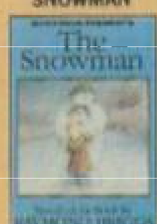
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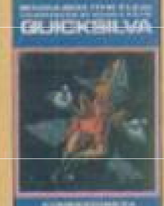
SPECTRUM 48K £6.95
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SNOWMAN



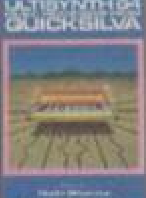
SPECTRUM 48K £6.95

BOOGABOO



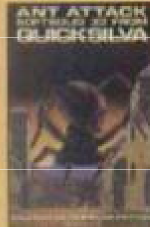
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ULTISYNTH



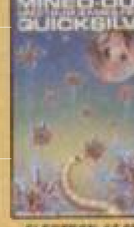
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WORLD QUIZ ATARI

THIS PROGRAM, FOR any Atari, plots a map of the world in green on a blue background. A particular country, continent or other feature is then highlighted and you are asked to choose from four alternative answers. Press 1 to 4 as appropriate — ensure that you are not in lower case or inverse video otherwise and answers will be ignored.

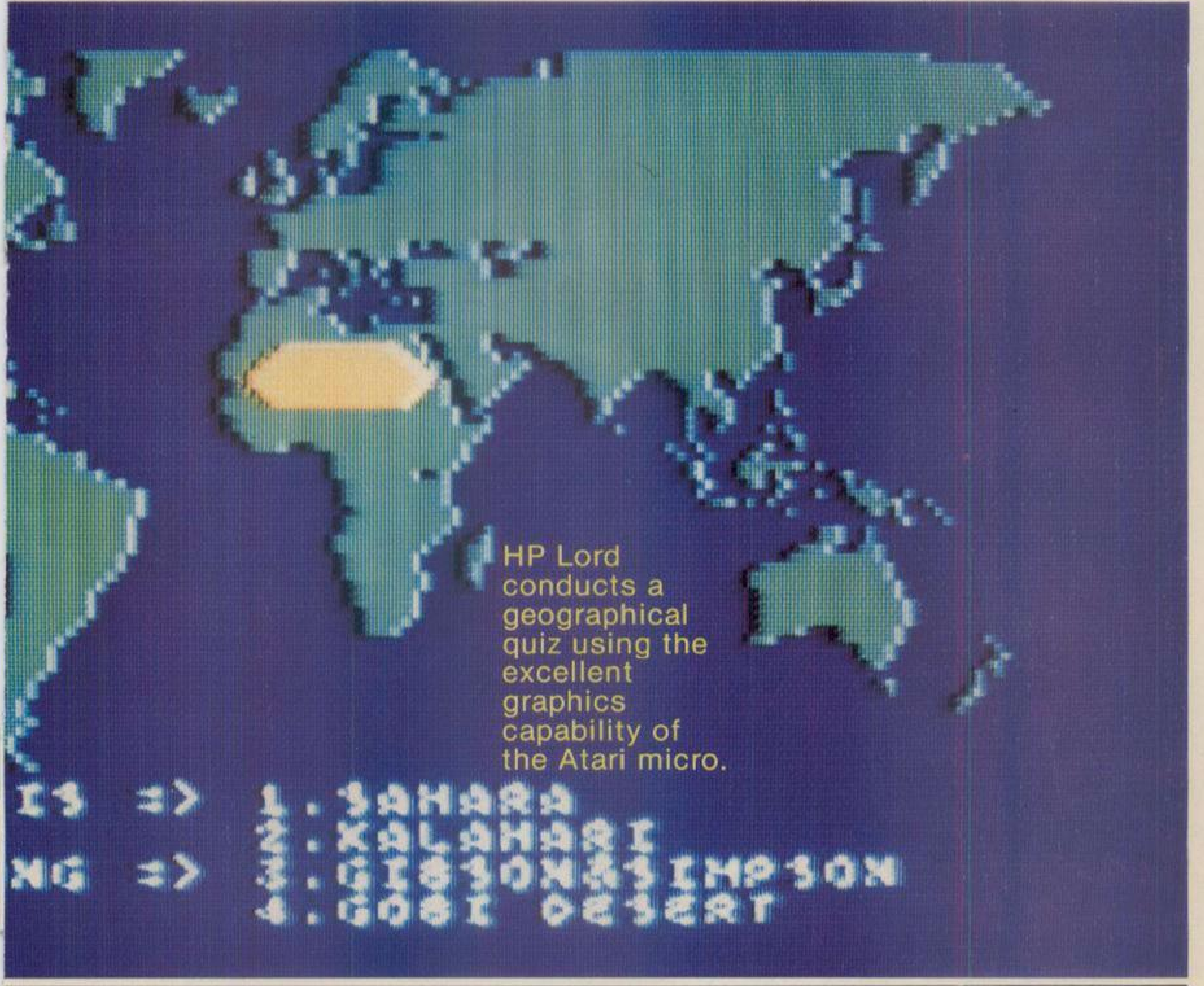
Your answers will be marked correct/wrong and the highlighted area will be returned to its original colour. After 10 questions your score will be displayed and pressing Start will cause another 10 questions to be presented. The variables used in the program are:

X, Y, L	— The map is plotted as a series of horizontal lines. X, Y are the start co-ordinates and L is the line length.
I	— Loop variable.
R	— Random question line number.
Q	— Array of already asked questions to prevent repeats
SP1$, SP2$	— Empty strings used for blanking other strings or text areas.
T	— Total questions asked in round.
S	— Score in round.
A1$-A4$	— Four alternative answers.
A	— Correct answer.
K	— Keyboard response.

The program is structured as follows:

Line	Function
1-10	Title plus skip over subroutines.
100-120	Subroutine to plot selected.
200-240	Subroutine to randomly select question and check not asked this round.
300	Subroutine to clear centre and right text areas of screen.
400	Subroutine to clear centre text area of screen.
1000-1110	Initial run processing — plots world, prints title, dimensions arrays, opens keyboard.
1150-1160	Initial round processing — sets score, turn, question array to zero.
1200-1520	Turn processing — selects question, restores appropriate data statement, reads and prints question, plots selected area, accepts and checks answer, restores question data again and replots area in original colour.
1800-1890	End of round processing — prints score after 10 questions and waits for start key to be pressed.
4100-10000	Data statements.

```
1 REM ##########################
2 REM ##### WORLD QUIZ #####
3 REM ##### H.P.LORD   #####
4 REM ##### MAR 1984   #####
5 REM ##########################
10 GOTO 1000
100 READ Y:IF Y=-1 THEN RETURN
110 READ X:READ L
120 PLOT X,Y:DRAWTO X+L-1,Y:GOTO 100
200 R=INT(RND(0)*28)*100+4100
210 I=0
220 I=I+1:IF R=Q(I) THEN 200
230 IF Q(I)<>0 THEN 220
240 Q(I)=R:RETURN
300 FOR I=0 TO 3:POKE 656,I:POKE 657,8:PRINT SP1$;
SP2$;:NEXT I:RETURN
400 FOR I=0 TO 3:POKE 656,I:POKE 657,8:PRINT SP1$;
:NEXT I:RETURN
1000 GRAPHICS 7:POKE 752,1:POKE 712,128:POKE 708,1
66:POKE 709,26:POKE 710,128
1010 DIM A1$(20),A2$(20),A3$(20),A4$(20),SP1$(8),S
P2$(23),Q(10)
1020 SP2$="                       ":SP1$=SP2$
1040 OPEN #1,4,0,"K:"
1050 POKE 656,0:POKE 657,0:? "########";
1060 POKE 656,1:POKE 657,0:? "#WORLD#";
1070 POKE 656,2:POKE 657,0:? "#QUIZ #";
1080 POKE 656,3:POKE 657,0:? "########";
1100 RESTORE 5100:COLOR 1
1110 READ A1$:IF A1$<>"###" THEN READ A2$:READ A3$
:READ A4$:READ A:GOSUB 100:GOTO 1110
1150 T=0:S=0
1160 FOR I=1 TO 10:Q(I)=0:NEXT I
1200 GOSUB 300:T=T+1:IF T>10 THEN GOTO 1800
1210 A1$=SP2$:A2$=SP2$:A3$=SP2$:A4$=SP2$
1300 GOSUB 200:RESTORE R:READ A1$:READ A2$:READ A3
$:READ A4$:READ A:COLOR 2:GOSUB 100
1310 POKE 656,0:POKE 657,8:? " IS THIS 1.";A1$;
1320 POKE 656,1:POKE 657,8:? "      OR 2.";A2$;
1330 POKE 656,2:POKE 657,8:? "      OR 3.";A3$;
1340 POKE 656,3:POKE 657,8:? "      OR 4.";A4$;
1350 GET #1,K:IF K<49 OR K>52 THEN GOTO 1350
1360 K=K-48:GOSUB 400
1370 POKE 656,K-1:POKE 657,8
1380 IF K=A THEN ? "CORRECT>";:S=S+1:GOTO 1500
1390 ? "WRONG =>";
1400 POKE 656,A-1:POKE 657,8
1410 ? "IT IS =>";
1500 FOR I=1 TO 1500:NEXT I
1510 RESTORE R:READ A1$:READ A2$:READ A3$:READ A4$
:READ A:COLOR 1:GOSUB 100
1520 GOTO 1200
1800 POKE 656,0:POKE 657,10:? "YOU SCORED ";S;" OU
T OF 10";
1810 A1$="TERRIBLE         "
1820 IF S>1 THEN A1$="NOT SO GOOD"
1830 IF S>4 THEN A1$="NOT TOO BAD"
1840 IF S>7 THEN A1$="VERY GOOD  "
1850 IF S>9 THEN A1$="EXCELLENT  "
1860 POKE 656,1:POKE 657,12:? "THAT'S ";A1$;
1870 POKE 656,3:POKE 657,8:? "PRESS START FOR ANOT
HER TURN";
1880 IF PEEK(53279)=6 THEN GOTO 1150
1890 GOTO 1880
4100 DATA ANDES,ROCKY,HIMALAYAN,ATLAS MTS,4
4110 DATA 28,69,4,29,68,3,30,68,2,31,67,2,-1
4200 DATA ANDES,ROCKY,HIMALAYAN,ATLAS MTS,3
4210 DATA 27,102,5,28,103,5,29,104,5,30,106,5,31,1
07,5,-1
4300 DATA SAHARA,KALAHARI,GIBSON&SIMPSON,GOBI DESE
RT,1
4310 DATA 32,71,12,33,70,14,34,69,16,35,68,18,36,6
8,18,37,69,16,38,70,14,-1
4400 DATA SAHARA,KALAHARI,GIBSON&SIMPSON,GOBI DESE
RT,2
4410 DATA 57,77,4,58,78,4,59,78,3,60,78,2,-1
4500 DATA SAHARA,KALAHARI,GIBSON&SIMPSON,GOBI DESE
RT,3
4510 DATA 57,120,8,58,119,10,59,119,10,60,120,8,-1
4600 DATA CHILE,ARGENTINA,PERU,BRAZIL,1
4610 DATA 55,44,2,56,44,2,57,44,2,58,44,2,59,44,2,
60,44,2,61,44,2,62,43,2,63,43,2,64,43,2,65,43,2
4615 DATA 66,43,2,67,43,2,68,43,2,69,43,2,70,43,2,
71,43,2,72,43,2,73,43,2,74,43,2,75,43,2
4620 DATA 76,43,2,77,44,1,78,45,1,-1
4700 DATA CHILE,ARGENTINA,PERU,BRAZIL,2
4710 DATA 57,45,2,58,45,3,59,45,4,60,45,6,61,45,5,
62,44,5,63,44,4,64,44,4,65,44,4,66,44,3,67,44,3
4715 DATA 68,44,3,69,44,3,70,44,3,71,44,2,72,44,2,
73,44,3,74,44,2,75,44,1,76,44,1,77,45,1,78,46,1,-1
4800 DATA CHILE,ARGENTINA,PERU,BRAZIL,4
4810 DATA 43,46,2,44,46,2,44,51,1,45,44,4,45,49,3,
46,44,10,47,44,12,48,42,16,49,42,16,50,43,15
4815 DATA 51,46,11,52,47,10,53,48,9,54,49,8,55,49,
7,56,49,7,57,50,5,58,50,4,59,50,3,60,49,4
4820 DATA 61,49,4,62,50,2,-1
4900 DATA SCANDINAVIA,RUSSIA,ICELAND,HOLLAND,1
4910 DATA 0,80,4,1,79,5,2,78,5,3,78,6,4,77,7,5,77,
4,5,83,1,6,76,5,6,82,2,7,75,6,7,82,2
4915 DATA 8,74,5,8,81,4,9,74,6,10,74,5,11,74,2,11,
77,2,12,77,2,13,77,1,-1
5000 DATA CANARY ISLANDS,JAPAN,BRITISH ISLES,ENGLA
ND,3
5010 DATA 11,70,1,12,70,2,13,68,1,13,70,2,14,67,2,
14,71,2,15,67,2,15,72,3,16,69,3,-1
5100 DATA NEW ZEALAND,AUSTRALIA,JAPAN,MADAGASCAR,2
5110 DATA 52,124,3,52,129,1,53,124,3,53,129,1
5115 DATA 54,122,4,54,128,3,55,121,10,56,118,14
5120 DATA 57,117,15,58,117,16,59,118,15,60,118,16
5125 DATA 61,118,16,62,118,16,63,118,5,63,126,7
5130 DATA 64,117,3,64,126,7,65,128,4,66,128,4
5135 DATA 67,129,2,69,130,2,70,131,1,-1
5200 DATA NEW ZEALAND,AUSTRALIA,JAPAN,MADAGASCAR,1
5210 DATA 64,141,1,65,142,1,66,142,2,67,141,2
5215 DATA 68,140,1,68,142,1,69,140,1,70,139,2
5220 DATA 71,138,2,72,138,1,-1
5300 DATA BRAZIL,CENTRAL AMERICA,CHILE,SOUTH AMERI
CA,4
5310 DATA 41,42,3,42,41,7,43,41,8,44,41,11,45,40,1
2,46,39,15
5315 DATA 47,40,16,48,39,19,49,40,18,50,41,17,51,4
1,16,52,42,15
5320 DATA 53,42,15,54,43,14,55,44,12,56,44,12,57,4
4,11,58,44,10
5325 DATA 59,44,9,60,44,9,61,44,9,62,43,9,63,43,8,
64,43,7
5330 DATA 65,43,6,66,43,6,67,43,6,68,43,5,69,43,4,
70,43,4
5335 DATA 71,43,3,72,43,3,73,43,4,74,43,3,75,43,2,
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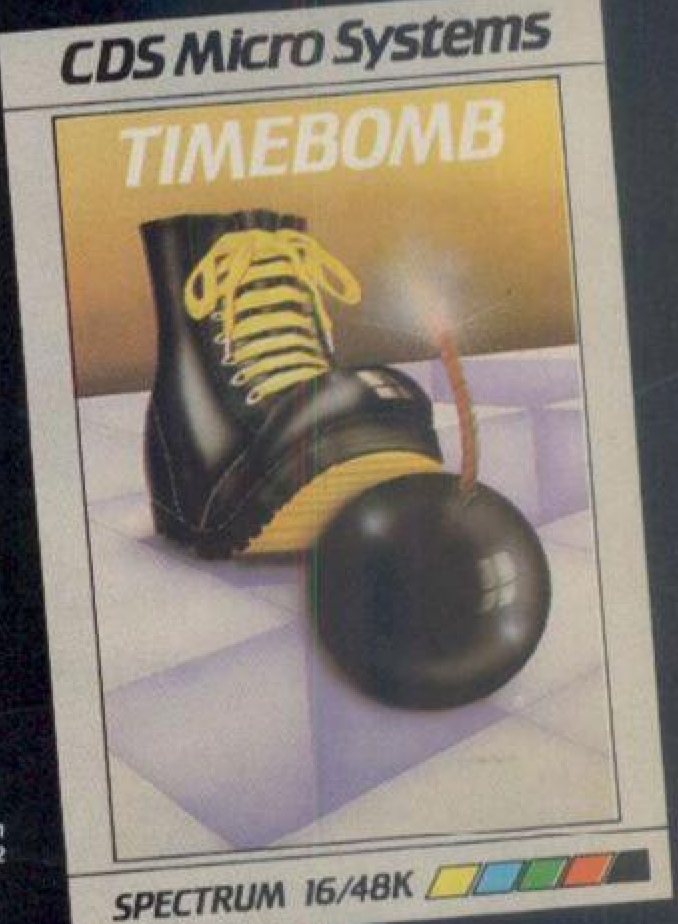
HP Lord conducts a geographical quiz using the excellent graphics capability of the Atari micro.

```
76,43,2
5340 DATA 77,44,2,78,45,2,-1
5400 DATA U.S.A.,MEXICO+CENT.AMERICA,FLORIDA,CUBA,
2
5410 DATA 28,25,2,29,25,1,29,27,3,30,26,1,30,28,3,
31,26,1,31,28,4,32,27,1,32,29,4
5415 DATA 33,27,1,33,29,4,34,30,3,35,30,3,35,36,1,
36,30,3,36,35,2
5420 DATA 37,31,6,38,32,5,39,35,4,40,37,2,41,38,2,
42,39,2,-1
5500 DATA WEST INDIES,EAST INDIES,CANARY ISLES,BAL
EARIC ISLES,1
5510 DATA 33,42,1,34,38,3,34,44,1,35,40,2,36,43,2
5515 DATA 37,40,1,37,42,3,37,46,1,38,47,1,39,49,1,
40,47,1,-1
5600 DATA CANADA,MEXICO,U.S.A.,ALASKA,3
5610 DATA 0,7,9,1,6,10,2,7,9,3,8,8,4,5,11,5,6,10,6
,8,8,7,7,9,8,6,10,9,7,4,9,12,1,9,14,2
5615 DATA 10,7,4,10,16,1,11,9,2,11,17,1,12,8,1,12,
18,1,13,7,1,13,19,1,35,8,1,36,10,1
5620 DATA 19,22,12,20,22,13,21,22,16,21,45,1,22,22
,14,22,37,1,22,41,3,23,22,16,23,39,4,24,23,19
5625 DATA 25,24,18,26,24,17,27,25,15,28,27,12,29,3
0,9,30,31,3,30,38,2,31,32,1,31,39,1,32,39,1,-1
5700 DATA CANADA,MEXICO,U.S.A.,ALASKA,1
5710 DATA 0,16,1,0,19,5,0,26,5,0,42,3,1,16,10,1,33
,6,1,42,3,2,16,12,2,29,11,2,42,4,3,16,12,3,29,11
5715 DATA 3,42,6,4,16,22,4,42,6,5,16,21,5,38,2,5,4
1,5,6,16,17,6,37,3,6,43,3,7,16,11,7,29,6,7,33,2
5720 DATA 7,37,2,8,16,10,8,28,6,8,41,4,9,16,18,9,4
1,4,10,17,17,10,41,4,10,46,1,11,18,17,11,41,6
5725 DATA 12,19,17,12,41,7,13,20,18,13,41,8,14,20,
20,14,41,9,15,20,20,15,41,9,16,21,20,16,41,7
5730 DATA 17,21,26,17,49,1,18,22,24,18,49,1,19,34,
3,19,38,7,19,48,3,20,38,8,20,48,3
5735 DATA 21,40,4,21,46,2,22,39,2,-1
5800 DATA CANADA,GREENLAND,NORWAY,ICELAND,2
5810 DATA 0,51,11,1,52,9,2,52,8,3,51,7,4,51,5,5,51
,5,6,51,4,7,52,3,8,52,3,9,54,1,-1
5900 DATA CANADA,GREENLAND,NORWAY,ICELAND,4
5910 DATA 4,62,1,4,66,1,5,62,5,6,62,4,7,63,2,-1
6000 DATA JAPAN,KOREA,PHILIPPINES,NEW ZEALAND,1
6010 DATA 20,129,1,21,128,3,23,128,1,24,128,1,25,1
27,2,26,125,3,27,124,3,28,124,1,-1
6100 DATA MADAGASCAR,CANARY ISLES,JAPAN,PHILIPPINE
S,1
6110 DATA 52,91,1,53,90,2,54,89,3,55,89,3,56,89,2,
57,89,2,58,90,1,-1
6200 DATA EGYPT,SOUTH AMERICA,MADAGASCAR,AFRICA,4
6210 DATA 26,73,3,27,69,1,27,71,5,28,68,7,29,67,10
,29,80,1,30,67,11,30,80,5,31,67,18
6215 DATA 32,66,20,33,65,21,34,65,22,35,65,22,36,6
6,22,37,66,22,38,65,23,39,65,24
6220 DATA 40,66,23,40,91,1,41,66,26,42,67,24,43,68
,4,43,74,16,44,76,14,45,76,13,46,76,9,46,86,2
6225 DATA 47,77,11,48,77,11,49,77,11,50,78,11,51,7
7,12,52,77,11,53,76,11,54,76,10,55,77,8
6230 DATA 56,77,8,57,77,9,58,78,8,59,78,7,60,78,7,
61,79,6,62,79,5,63,79,4,-1
6300 DATA EUROPE,SCANDINAVIA,RUSSIA,FRANCE,1
6310 DATA 11,70,1,12,70,2,13,68,1,13,70,2,14,67,2,
14,71,2,15,67,2,15,70,3,16,69,3
6315 DATA 0,80,4,1,79,5,2,78,5,3,78,6,4,77,7,5,77,
4,5,83,1,6,76,5,6,82,2,7,75,6,7,82,2
6320 DATA 8,74,5,8,81,4,9,74,6,10,74,5,11,74,2,11,
77,2,12,77,2,13,77,1
6325 DATA 13,75,1,14,75,2,15,75,2,16,74,7,17,73,8,
18,70,11,19,70,11,20,71,12,21,71,12
6330 DATA 22,68,5,22,76,2,22,79,5,23,68,5,23,77,2,
23,80,2,23,83,7,24,68,4,24,75,1
6335 DATA 24,78,1,24,80,1,24,83,7,25,68,4,25,78,1,
25,81,1,25,83,7,26,69,2,26,77,1
6340 DATA 27,82,1,27,84,1,-1
6400 DATA EUROPE,SCANDINAVIA,RUSSIA,FRANCE,3
6410 DATA 0,99,37,1,84,1,1,96,2,1,99,45,2,83,4,2,9
6,2,2,99,46,3,83,5,3,89,1,3,91,55
6415 DATA 4,84,1,4,86,2,4,90,57,5,84,2,5,88,61,6,8
4,2,6,88,57,6,146,2,7,84,59,8,85,50,8,137,4
6420 DATA 9,85,1,9,87,47,9,137,2,10,82,52,10,136,2
,11,81,47,11,135,3,12,81,46,12,134,4
6425 DATA 13,81,45,13,134,3,14,81,47,14,134,2,15,8
0,48,15,129,1,15,134,2,16,81,39,16,122,6
6430 DATA 16,129,1,16,134,1,17,81,31,17,113,7,17,1
23,5,17,129,1,18,81,26,18,123,4,18,129,1
6435 DATA 19,81,26,19,124,4,20,83,23,20,126,2,21,8
3,1,21,85,1,21,87,4,21,93,3,21,97,8
6440 DATA 21,125,2,22,88,3,22,92,3,22,97,7,22,124,
2,23,89,3,23,94,10,24,94,7,25,96,2,-1
6500 DATA TIBET,CHINA,INDIA,MONGOLIA,4
6510 DATA 17,112,1,18,107,12,19,108,12,20,109,10,2
1,109,9,22,110,7,-1
6600 DATA TIBET,CHINA,INDIA,MONGOLIA,2
6610 DATA 16,120,2,17,120,3,18,119,4,19,107,1,19,1
20,4,20,106,3,20,119,7,21,105,4,21,118,7
6615 DATA 22,104,6,22,117,7,23,104,16,23,121,2,24,
101,18,25,101,20,26,102,18,27,103,17
6620 DATA 28,104,16,29,104,16,30,106,15,31,108,13,
32,110,11,33,111,9,34,112,7,35,115,3,36,116,1,-1
6700 DATA TIBET,CHINA,INDIA,MONGOLIA,3
6710 DATA 29,102,3,30,101,3,31,101,9,32,100,7,32,1
08,2,33,100,7,33,109,1,34,99,8,35,100,7
6715 DATA 36,101,5,37,101,4,38,102,2,39,102,2,40,1
02,1,-1
6800 DATA WEST INDIES,EAST INDIES,CANARY ISLES,BAL
EARIC ISLES,2
6810 DATA 43,109,1,44,110,1,45,111,2,46,111,2,47,1
12,2,48,112,1
6815 DATA 49,113,3,49,117,1,49,119,1,50,121,1
6820 DATA 43,118,2,44,117,2,45,116,4,46,116,3,47,1
17,2
6825 DATA 37,120,1,38,120,1,39,120,2,41,119,1,41,1
21,1,42,121,2,43,122,1
6830 DATA 45,120,3,45,124,1,46,120,1,46,126,2,47,1
20,2,47,127,1,47,129,1
6835 DATA 48,120,1,48,124,1,48,127,4,49,128,5,50,1
29,2,50,132,1,51,132,2
6840 DATA 48,133,1,49,135,1,50,136,1,51,137,1,-1
9000 DATA OTHERS,X,X,X,1
9010 DATA 32,107,1,33,107,2,34,107,2,23,123,2,24,1
23,1,25,123,2,26,124,1,41,104,1,33,121,1,34,121,1
9015 DATA 24,90,2,25,86,18,26,86,18,27,86,18,28,86
,18,29,86,18,30,85,21,31,86,6,31,93,11,32,87,5
9020 DATA 32,96,8,33,87,6,33,94,1,33,97,7,34,88,8,
35,88,7,36,89,5,37,89,4,38,90,2,39,90,1
9025 DATA 31,104,8,32,104,8,33,104,8,34,104,12,35,
109,5,36,110,4,37,111,4,38,111,5
9030 DATA 39,111,1,39,113,3,40,111,1,40,114,2,41,1
11,1,41,114,1,42,111,1,43,112,1,44,113,1,-1
10000 DATA ###
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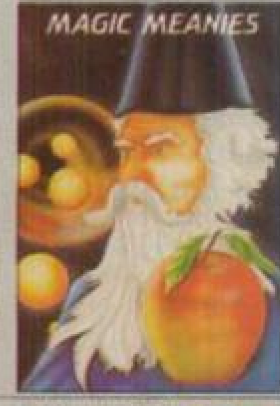
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LEAPFROG	XXX	1003	BREAKOUT	XXX	2004			
REVERSI	XXX	1004	BRICK-STOP	XXX	2005			
3 D PAINTER	XXX	1005	REVERSI	XXX	2006			
BOZY BOA	XXX	1006						
POOL	XXX	1007						







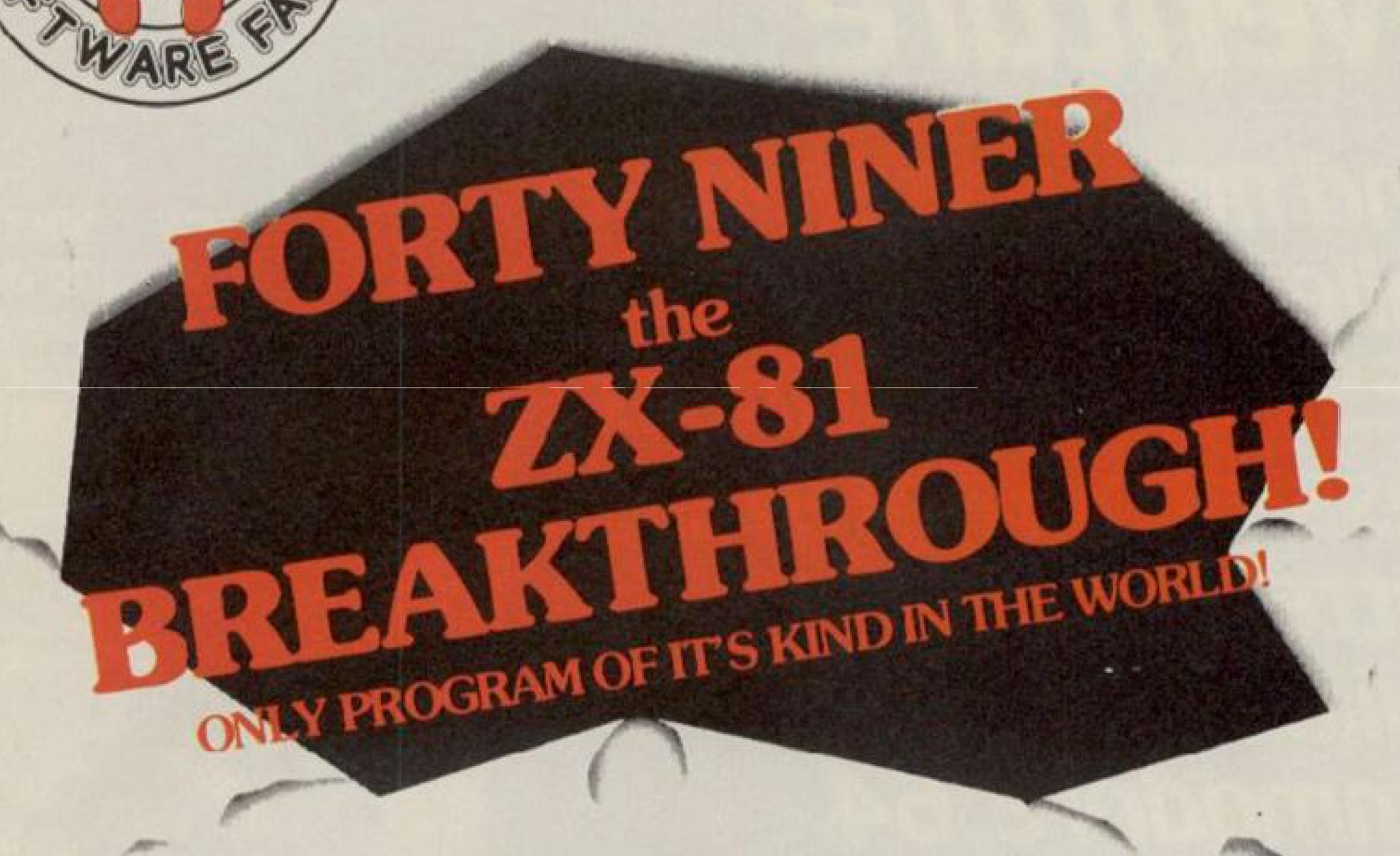




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All the time the Gremlin (8) is busy digging it's way through your waste earth pile (9) to reach the entrance to your mine. Once it does you have no escape!! – so you must stop it getting there by returning to the surface to replenish the main mound (9) with the smaller pile of earth which appears on the surface as you dig (10). The deeper you dig the more points you score – but the further you have to go to replenish that mound! Once all nuggets have been collected, a cave opens (11) allowing you to pass through to the next stage – if you can reach it! This gives you more rats – but less snakes to destroy them with!!



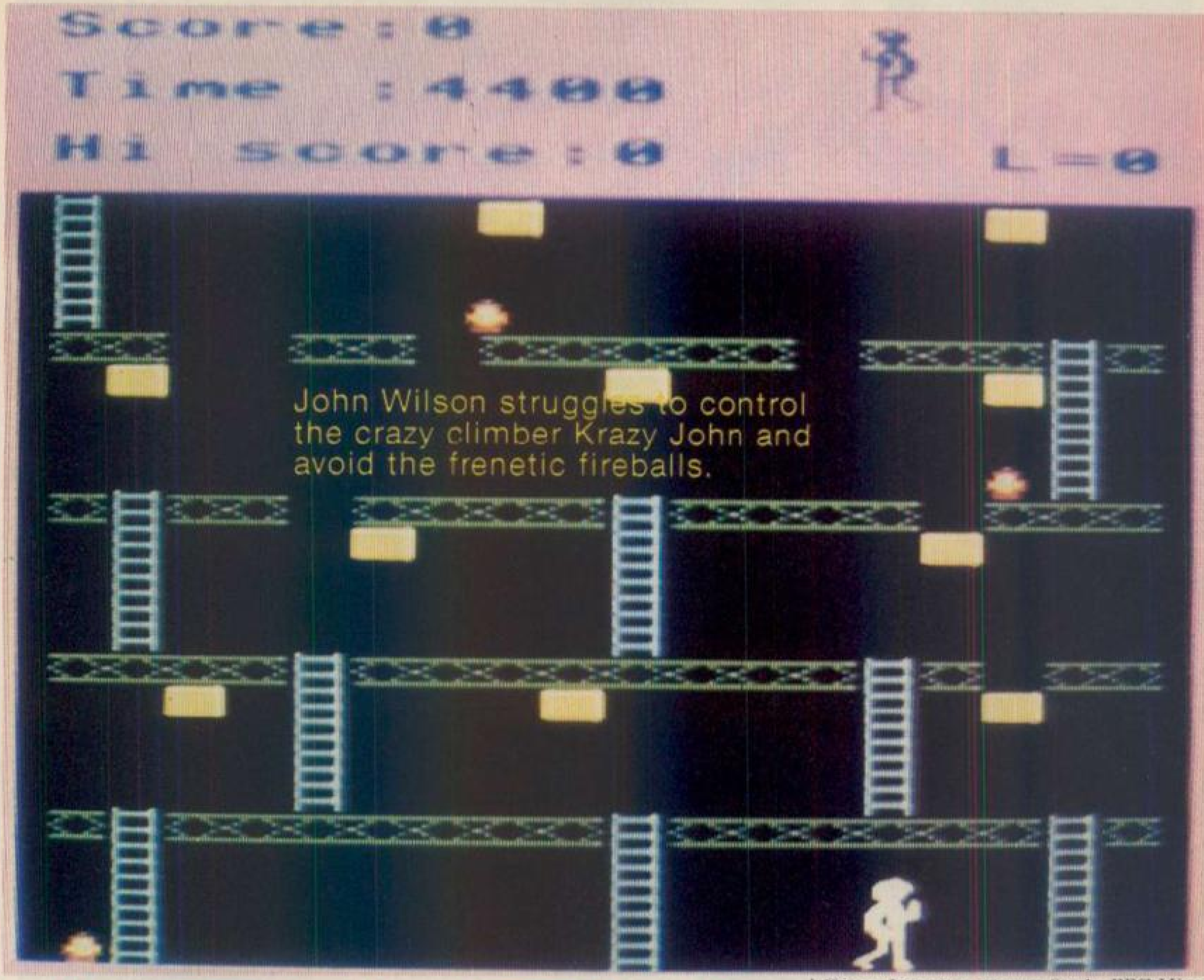
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John Wilson struggles to control the crazy climber Krazy John and avoid the frenetic fireballs.

KRAZY JOHN

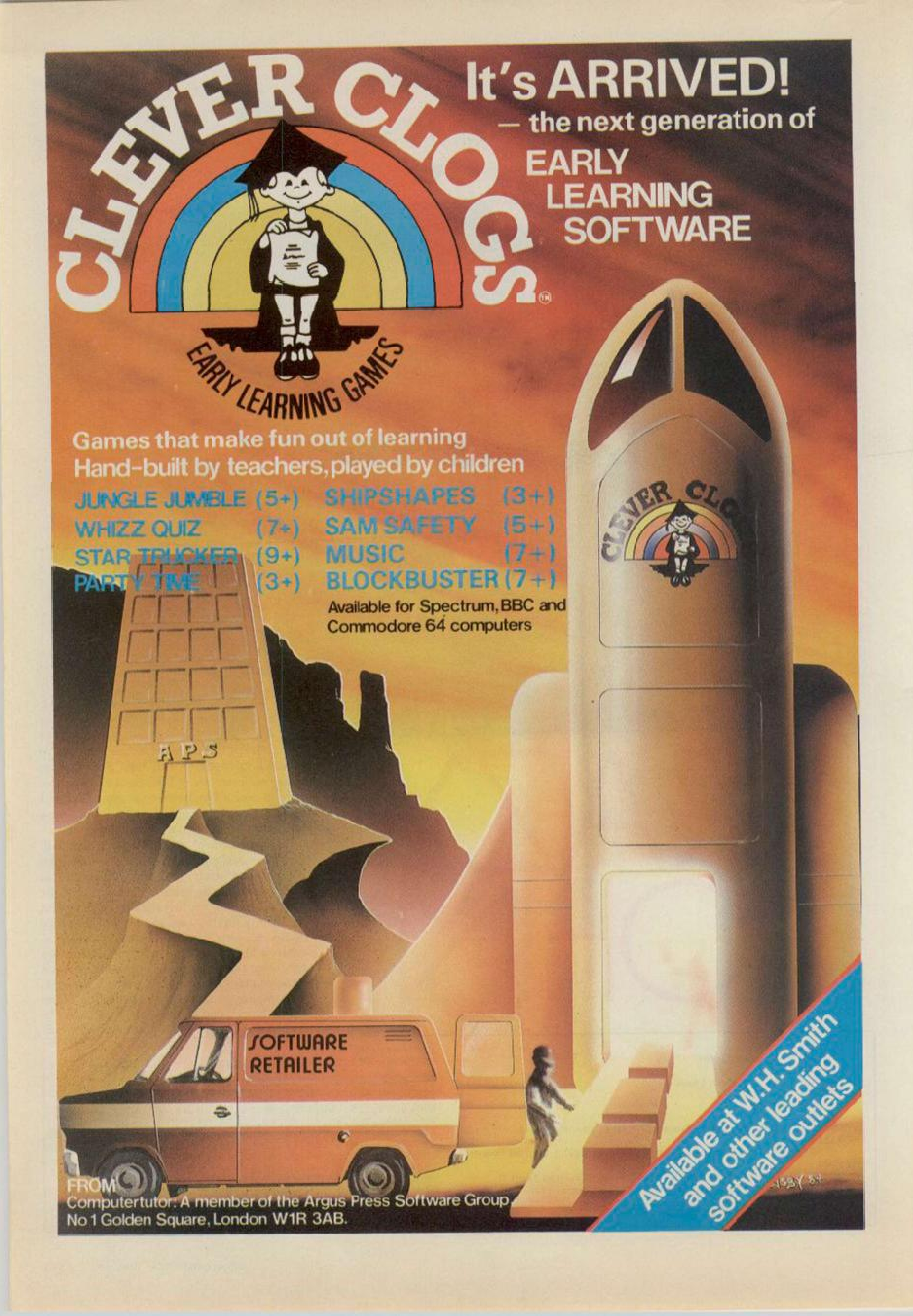
KRAZY JOHN IS A program for the BBC Micro Model B or Model A with 32K. The program makes extensive use of BBC Basic and machine code to give a fast arcade-type game. Before I go into how the program works, I will give a brief description of how to play the game.

You take control of Krazy John, the foolhardy climber, and must try to climb the high rise building before your time runs out. You must climb up the ladders and run along the girders, jumping the fireballs that spread along the floor, jump the gaps and collect the yellow blocks on your way to the top. In order to collect a block, you must jump up underneath one. Once this has been done, you are awarded some points, and the final elevator is lowered. To complete the screen, you must collect all the yellow blocks, and climb up the final ladder in

(continued on page 115)

```
   10REM
   20REM   Krazy  John
   30REM
   40REM   by  J.R.Wilson
   50REM
   60ONERRORRUN
   70MODE7
   80PROCL(3,3,CHR$132+CHR$157+CHR$134+"K R A Z Y  "+C
HR$156)
   90PROCL(17,7,CHR$132+CHR$157+CHR$134+"J O H N  "+CH
R$156)
  100PROCL(8,12,CHR$129+"by"+CHR$130+"J.R.Wilson")
  110PROCL(3,18,"Do you want instructions ?")
  120A$=GET$
  130IFA$="Y"THENPROCinstructions:GOTO150
  140IFA$<>"N"THEN120
  150ENVELOPE1,5,1,0,0,10,1,1,126,-1,-2,-3,126,120
  160CLS
  170ENVELOPE2,3,0,0,0,0,0,0,126,-1,-2,-5,126,80
  180VDU23,224,0,0,56,108,60,60,24,152
  190VDU23,225,188,172,246,54,54,38,44,60
  200VDU23,226,40,40,40,40,36,34,33,98
  210VDU23,227,0,0,28,54,60,60,24,25
  220VDU23,228,61,53,111,108,108,100,52,60
  230VDU23,229,20,20,20,20,36,68,132,70
  240VDU23,230,0,0,0,1,135,143,252,15
  250VDU23,231,0,0,2,130,231,245,29,247
  260VDU23,232,1,2,1,0,65,51,15,3
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(listing continued on page 115)


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(listing continued from page 113)

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270VDU23,233,192,192,192,128,192,224,32,208
280VDU23,234,3,3,1,3,14,152,112,32
290VDU23,235,236,224,192,224,56,14,4,0
300VDU23,236,3,3,3,1,3,1,4,27
310VDU23,237,128,64,128,0,130,204,240,192
320VDU23,238,35,3,3,7,28,112,32,16
330VDU23,239,192,192,128,224,48,25,14,4
340VDU23,242,0,255,36,66,129,66,36,255
350VDU23,243,66,66,66,66,66,66,66,102
360VDU23,244,60,60,60,60,60,60,60,60
370VDU23,245,126,153,153,189,189,189,153,129
380VDU23,246,66,126,66,66,66,126,66,66
390VDU23,247,0,255,255,255,255,255,255,255
400VDU23,248,0,24,60,60,61,61,25,25
410VDU23,249,61,126,188,188,188,188,188,188
420VDU23,250,36,36,36,36,36,32,32,32
430PROCm_code
440CLEAR
450move=2351:poke=2304:XP=2452:YP=2472:DI=2492
460MODE2
470VDU23;8202;0;0;0;
480S%=0:W%=0:M%=3:CH=.02
490PROCscreen
[illegible]
```

(continued from page 113)

the top right hand corner. As the game progresses, more and more fireballs appear, and must be avoided at all costs. To move your man, use the following keys: Z left; X right; : up; / down; Return jump.

As the program uses many of the special features of the BBC Micro, it would be difficult to convert to any other computer. For those of you who are interested in modifying the program, I will give a brief description of what the main parts do.

Lines	Description
60	Trap any errors in the program
70 to 100	Print the title
110 to 140	Print instructions if required
150 to 170	Define sound envelopes
180 to 420	Define user characters
430	Read in machine code
450	Set up main variables for machine code
470	Make cursor invisible
480	Set up main variables for game
490	Print screen
500	Move fireballs
510 to 520	Have you stepped on a fireball?
530 to 570	Move your man
610	Define graphics window
620	Update score
630 to 640	Read character at given co-ordinates
650 to 1780	Print screen
780 to 800	Print girders
810 to 920	Print ladders
950 to 1020	Put gaps in girders
1090 to 1110	Add yellow blocks to screen
1130 to 1230	Set up fireballs
1290	Delay loop
1300	Plot man
1310 to 1330	Move man left
1340 to 1360	Move man right
1370 to 1400	Move man up
1410 to 1430	Move man down
1440 to 1530	Jump up
1540 to 1580	Jump to left
1590	Plot man jumping to left
1600	Plot man jumping to right
1610 to 1650	Jump to right
1660 to 1680	Move fireballs
1690 to 1700	Fall down a gap
1710 to 1790	Collect a yellow block
1800	Go on to next screen
1810 to 1820	Update bonus timer
1830	Print in double height writing
1840 to 1890	Your man has died
1900 to 1930	Print your score and the high score
1940 to 1970	Play another game if required
2000	Read in machine code from data
2010 to 2100	Machine code in data
2130	Check for no errors in data
2150 to 2450	Print instructions

The main variables used in the program are as follows:

A$	General input
move	Pointer to machine code to move fireballs
poke	Pointer to machine code to Poke fireballs on screen
XP	Pointer to x positions of fireballs
YP	Pointer to y positions of fireballs
DI	Pointer to movement directions of fireballs
S%	Your score
W%	Screen number
M%	Number of men left
CH	Chance of a new fireball appearing
XI%	Your x position
YI%	Your y position
k%	Whether a key has been pressed
U%	Character to be printed for the man
L%	Number of yellow blocks left

To save memory, I have removed all unnecessary spaces from the program, so when typing in the program, do not add extra spaces. I also stored the machine code in pages 9 and 10. These pages are only used occasionally, so it is quite safe for a temporary store of machine code.

I have managed to test the program on both the 0.1 O.S. and the 1.2 O.S., with success, so the program should, hopefully, work on all versions. One final note, I have included a test in line 2130 to trap any errors in the data, before it is too late. I suggest that you include this line, otherwise the program could be over-written by the machine code. ■

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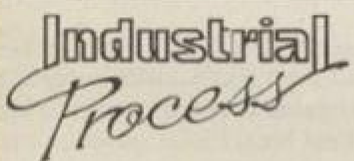
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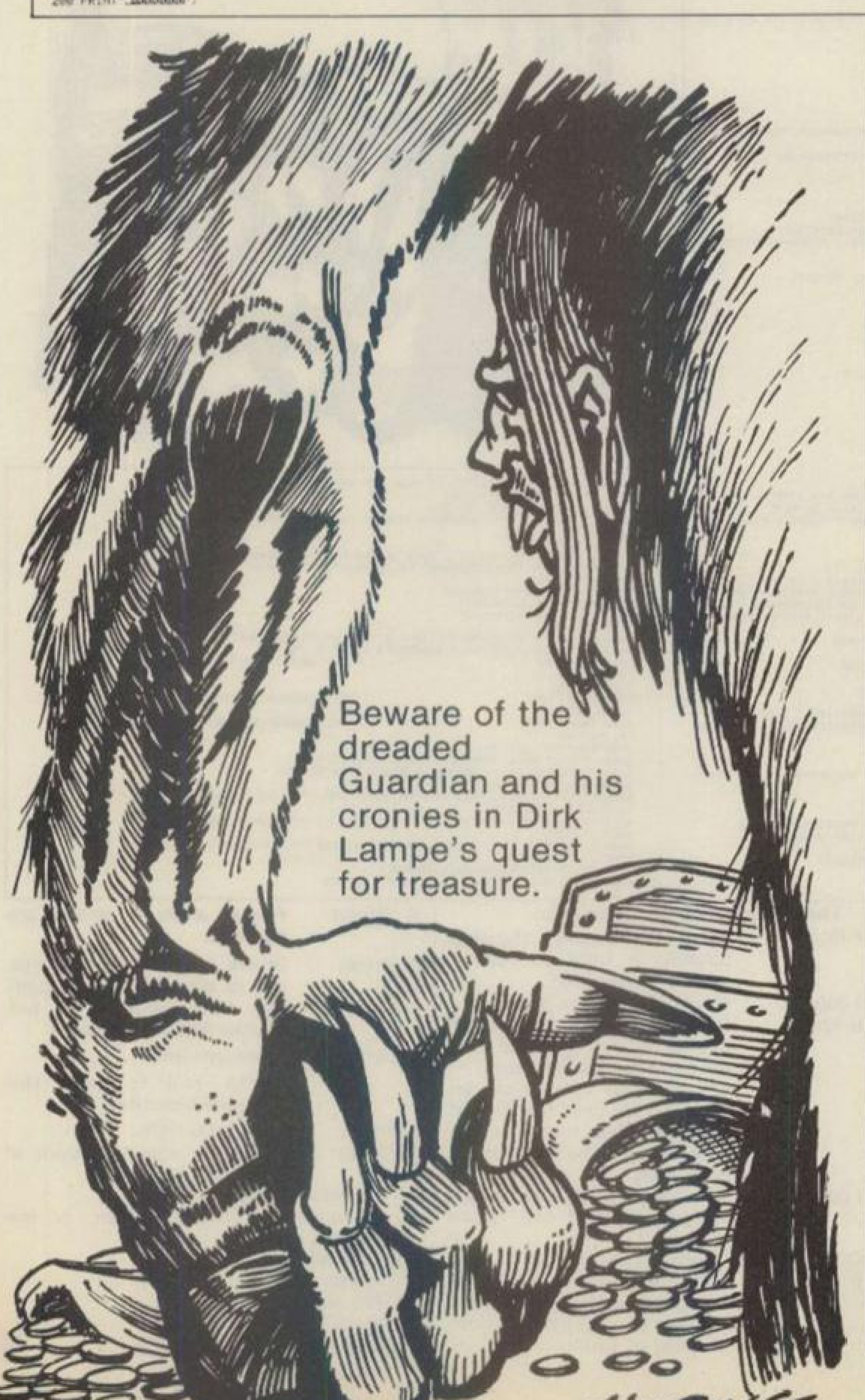
Address ______________________

YC6

THE GUARDIAN

```
1 POKE649,1:M=RND(-TI)
10 DATACLOAK OF INVISIBILITY,SWORD OF INVINCIBILITY,GLASS OF PROPHESY,RING OF ST
RENGTH
20 DATARING OF HEALING,KEY OF TREASURE,STAFF OF WISDOM,SHIELD OF DEFENCE
30 DATAHELMET OF SIGHT,MASK OF POWER
40 DATAGOBLIN,VAMPIRE,TROLL,GIANT,WIZARD,THE GUARDIAN
50 DATA20,50,100,150,300,5,30,200,2,2,10,30,25,75,10
110 INPUT"DIFFICULTY";D:NM=10*D*INT(RND(1)+1)+11:FORI=1TO5:CC$=CC$+CHR$(RND(1)*1
0+48)
120 NEXT:DIMM$(5),T$(9),C(5),T(9,2),M(NM+1,1),S(5),P$(9),W(9),D(5,3)
130 FORI=0TO9:READT$(I):NEXT:FORI=0TO5:READM$(I):NEXT:FORI=0TO4:READS(I):NEXT
135 FORI=0TO9:READW(I):NEXT
140 S=100:AA=20:EL=10:LE=1:SS=PEEK(648)*256:PO=SS+7*22+10:CL=38720-(SS<>7680)*20
72
150 FORI=0TO9:T(I,0)=INT(RND(1)*5)+1:M(I,0)=T(I,0):T(I,1)=INT(RND(1)*10)
160 M(I,1)=T(I,1):NEXT:FORI=0TO9:T(I,2)=SS+7*22+5+INT(RND(1)*12)*22+INT(RND(1)*1
2):NEXT
165 FORI=10TONM:M(I,0)=INT(RND(1)*5)+1:M(I,1)=INT(RND(1)*10):NEXT
170 A=114:WT=80:T(7,0)=5-INT(RND(1)+.5)
180 M(7,0)=T(7,0)
200 PRINT"[illegible]";
250 PRINTTAB(4)"[illegible]                    "
260 FORI=1TO12:PRINTTAB(4)"[illegible]                         [illegible] ":NEXT
270 PRINTTAB(4)"[illegible]
275 FORI=0TO9:IFT(I,0)<>LEORT(I,1)<>RMTHEN279
276 C=T(I,2)
277 IFC=PEEK(648)*256+161ORC=POTHENT(I,2)=T(I,2)+1:GOTO276
278 POKET(I,2),42
279 NEXT
280 IFRM<7THENPRINT"[illegible]"TAB(10)"X"
290 IFRM<>0ANDRM<>3ANDRM<>6ANDRM<>9THENPRINT"[illegible]"TAB(17)"X"
300 IFRM>2THENPRINT"[illegible]"TAB(10)"X"
310 IFRM<>0ANDRM<>1ANDRM<>4ANDRM<>7THENPRINT"[illegible]"TAB(4)"X"
320 IFRM=0THENPRINT"[illegible]"TAB(5)"UP":IFLE=1THENPRIN""[illegible]"TAB(5)"U "
330 IFLE=5ANDRM=0THENPRINT"[illegible]"TAB(5)"  [illegible]"
340 IFLE=5ANDRM=7THENPRINT"[illegible]"TAB(5)"[illegible]++++[illegible]"
361 PRINT"[illegible]LEVEL"LE:PRINT"[illegible]"TAB(10)"ROOM  "RM
370 GOSUB3650:GOSUB3660:GOSUB3670
376 IFV=9ANDLE<5THENV=0:GOSUB9900:PRINT"[illegible]MIDDLE NOS  "MID$(CC$,2,3)
```

(listing continued on next page)



Beware of the dreaded Guardian and his cronies in Dirk Lampe's quest for treasure.

DEEP IN AN immense, dark and unexplored jungle, far away in another Galaxy stands a house who's unearthly builders have long since been forgotten. Rumours ooze forth from the house, rumours of horror and oppressing terror — and consistently, a tale of incalculable wealth and treasure trove of wisdom hidden deep within the evil recesses of the house.

The treasure is guarded by a completely evil and merciless creature — the Guardian — who need never sleep or rest, and watches constantly over the safe containing the treasure. You have learnt also that the safe is on the fifth floor of the house, and even that it is in room seven of that floor.

In the house lie 10 other treasures which may help you in your quest for the treasure, but each treasure is guarded by a servant of the Guardian — goblins, vampires, trolls, giants and wizards in increasing order of strength and power — who must be killed before the treasure they guard can be stolen.

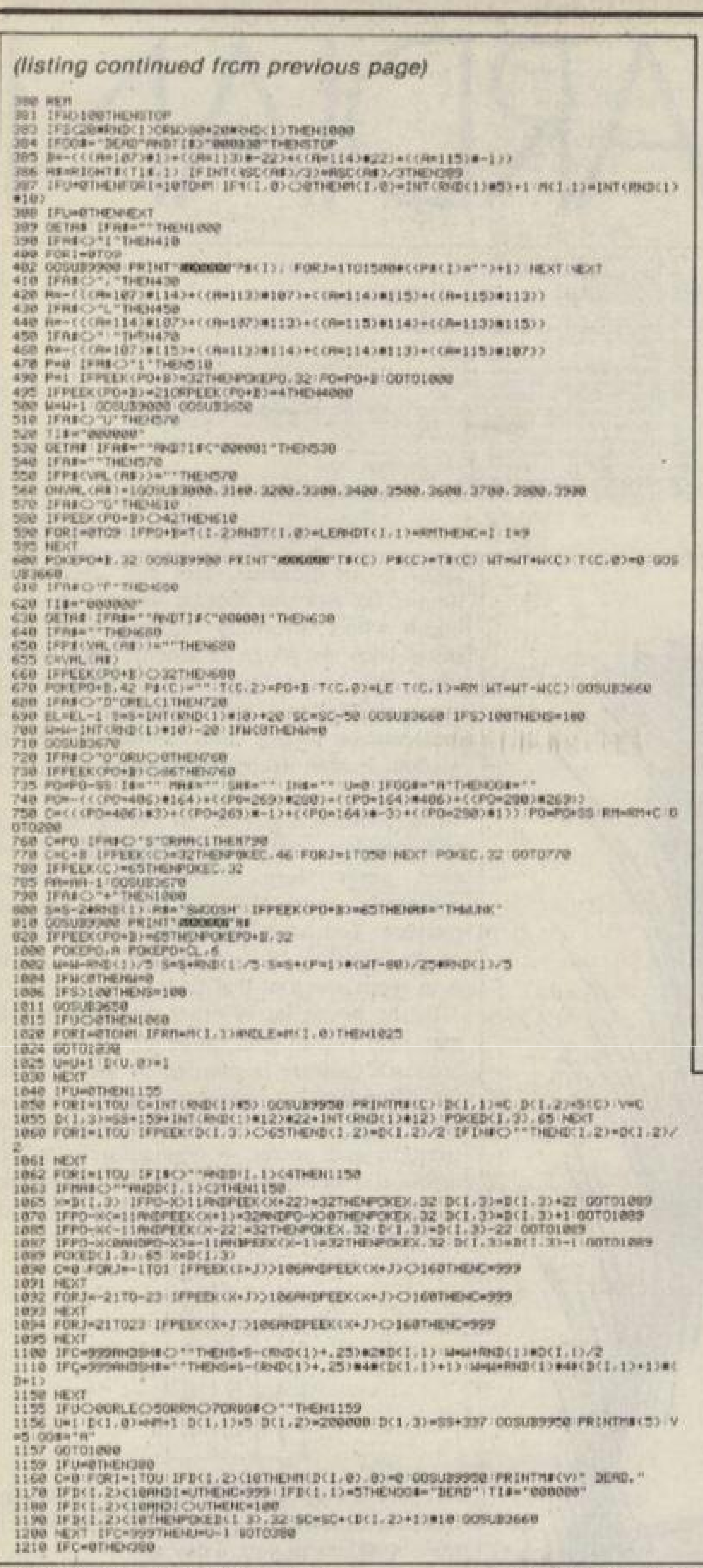
The house itself is made up of five floors of 10 rooms, organised as follows:

		0
1	2	3
4	5	6
7	8	9

There are 10 items of treasure, as already mentioned, scattered around the house, which may be of use to you. They are:

0 Cloak of Invisibility	No goblin, vampire, troll or giant can see you when this is worn.
1 Sword of Invincibility	Helps kill your adversaries.
2 Glass of Prophecy	Tells you the first number of the safe's combination.
3 Ring of strength	Reinvigourates you.
4 Ring of healing	Heals your wounds.
5 Key of treasures	In combination with the safe combination, will open the safe.
6 Staff of wisdom	Glows when enemies are present on your floor.
7 Shield of defence	Protects you from your foe's blows.
8 Helmet of Sight	If used within 30 seconds of the Guardian's death in the

(continued on next page)



(listing continued from previous page)

```
300 REM
301 IFW>100THENSTOP
303 IFS<20*RND(1)ORW>80+20*RND(1)THEN1000
304 IFOO$="DEAD"ANDTI$>"000030"THENSTOP
305 B=-(((A=107)*1)+((A=113)*-22)+((A=114)*22)+((A=115)*-1))
306 A$=RIGHT$(TI$,1):IFINT(ASC(A$)/3)=ASC(A$)/3THEN389
307 IFU=0THENFORI=1TONM:IFM(I,0)<>0THENM(I,0)=INT(RND(1)*5)+1:M(I,1)=INT(RND(1)
*10)
388 IFU=0THENNEXT
389 GETA$:IFA$=""THEN1000
390 IFA$<>"I"THEN410
400 FORI=0TO9
402 GOSUB9900:PRINT"■■■■■"P$(I);:FORJ=1TO1500*((P$(I)="")+1):NEXT:NEXT
410 IFA$<>";"THEN430
420 A=-(((A=107)*114)+((A=113)*107)+((A=114)*115)+((A=115)*113))
430 IFA$<>"L"THEN450
440 A=-(((A=114)*107)+((A=107)*113)+((A=115)*114)+((A=113)*115))
450 IFA$<>":"THEN470
460 A=-(((A=107)*115)+((A=113)*114)+((A=114)*113)+((A=115)*107))
470 P=0:IFA$<>"1"THEN510
490 P=1:IFPEEK(PO+B)=32THENPOKEPO,32:PO=PO+B:GOTO1000
495 IFPEEK(PO+B)=21ORPEEK(PO+B)=4THEN4000
500 W=W+1:GOSUB9000:GOSUB3650
510 IFA$<>"U"THEN570
520 TI$="000000"
530 GETA$:IFA$=""ANDTI$<"000001"THEN530
540 IFA$=""THEN570
550 IFP$(VAL(A$))=""THEN570
560 ONVAL(A$)+1GOSUB3000,3100,3200,3300,3400,3500,3600,3700,3800,3900
570 IFA$<>"G"THEN610
580 IFPEEK(PO+B)<>42THEN610
590 FORI=0TO9:IFPO+B=T(I,2)ANDT(I,0)=LEANDT(I,1)=RMTHENC=I:I=9
595 NEXT
600 POKEPO+B,32:GOSUB9900:PRINT"■■■■■"T$(C):P$(C)=T$(C):WT=WT+W(C):T(C,0)=0:GOS
UB3660
610 IFA$<>"P"THEN690
620 TI$="000000"
630 GETA$:IFA$=""ANDTI$<"000001"THEN630
640 IFA$=""THEN680
650 IFP$(VAL(A$))=""THEN680
655 C=VAL(A$)
660 IFPEEK(PO+B)<>32THEN680
670 POKEPO+B,42:P$(C)="":T(C,2)=PO+B:T(C,0)=LE:T(C,1)=RM:WT=WT-W(C):GOSUB3660
680 IFA$<>"D"OREL<1THEN720
690 EL=EL-1:S=S+INT(RND(1)*10)+20:SC=SC-50:GOSUB3660:IFS>100THENS=100
700 W=W-INT(RND(1)*10)-20:IFW<0THENW=0
710 GOSUB3670
720 IFA$<>"O"ORU<>0THEN760
730 IFPEEK(PO+B)<>86THEN760
735 PO=PO-SS:I$="":MA$="":SH$="":IN$="":U=0:IFOO$="A"THENOO$=""
740 PO=-(((PO=406)*164)+((PO=269)*280)+((PO=164)*406)+((PO=280)*269))
750 C=(((PO=406)*3)+((PO=269)*-1)+((PO=164)*-3)+((PO=280)*1)):PO=PO+SS:RM=RM+C:G
OTO200
760 C=PO:IFA$<>"S"ORAA<1THEN790
770 C=C+B:IFPEEK(C)=32THENPOKEC,46:FORJ=1TO50:NEXT:POKEC,32:GOTO770
780 IFPEEK(C)=65THENPOKEC,32
785 AA=AA-1:GOSUB3670
790 IFA$<>"←"THEN1000
800 S=S-2*RND(1):A$="SWOOSH":IFPEEK(PO+B)=65THENA$="THWUNK"
810 GOSUB9900:PRINT"■■■■■"A$
820 IFPEEK(PO+B)=65THENPOKEPO+B,32
1000 POKEPO,A:POKEPO+CL,6
1002 W=W-RND(1)/5:S=S+RND(1)/5:S=S+(P=1)*(WT-80)/25*RND(1)/5
1004 IFW<0THENW=0
1006 IFS>100THENS=100
1011 GOSUB3650
1015 IFU<>0THEN1060
1020 FORI=0TONM:IFRM=M(I,1)ANDLE=M(I,0)THEN1025
1024 GOTO1030
1025 U=U+1:D(U,0)=I
1030 NEXT
1040 IFU=0THEN1155
1050 FORI=1TOU:C=INT(RND(1)*5):GOSUB9950:PRINTM$(C):D(I,1)=C:D(I,2)=S(C):V=C
1055 D(I,3)=SS+159+INT(RND(1)*12)*22+INT(RND(1)*12):POKED(I,3),65:NEXT
1060 FORI=1TOU:IFPEEK(D(I,3))<>65THEND(I,2)=D(I,2)/2:IFIN$<>""THEND(I,2)=D(I,2)/
2
1061 NEXT
1062 FORI=1TOU:IFI$<>""ANDD(I,1)<4THEN1150
1063 IFMA$<>""ANDD(I,1)<3THEN1150
1065 X=D(I,3):IFPO-X>11ANDPEEK(X+22)=32THENPOKEX,32:D(I,3)=D(I,3)+22:GOTO1089
1070 IFPO-X<=11ANDPEEK(X+1)=32ANDPO-X>0THENPOKEX,32:D(I,3)=D(I,3)+1:GOTO1089
1085 IFPO-X<-11ANDPEEK(X-22)=32THENPOKEX,32:D(I,3)=D(I,3)-22:GOTO1089
1087 IFPO-X<0ANDPO-X>=-11ANDPEEK(X-1)=32THENPOKEX,32:D(I,3)=D(I,3)-1:GOTO1089
1089 POKED(I,3),65:X=D(I,3)
1090 C=0:FORJ=-1TO1:IFPEEK(X+J)>106ANDPEEK(X+J)<>160THENC=999
1091 NEXT
1092 FORJ=-21TO-23:IFPEEK(X+J)>106ANDPEEK(X+J)<>160THENC=999
1093 NEXT
1094 FORJ=21TO23:IFPEEK(X+J)>106ANDPEEK(X+J)<>160THENC=999
1095 NEXT
1100 IFC=999ANDSH$<>""THENS=S-(RND(1)+.25)*2*D(I,1):W=W+RND(1)*D(I,1)/2
1110 IFC=999ANDSH$=""THENS=S-(RND(1)+.25)*4*(D(I,1)+1):W=W+RND(1)*4*(D(I,1)+1)*(
D+1)
1150 NEXT
1155 IFU<>0ORLE<>5ORRM<>7OROO$<>""THEN1159
1156 U=1:D(1,0)=NM+1:D(1,1)=5:D(1,2)=200000:D(1,3)=SS+337:GOSUB9950:PRINTM$(5):V
=5:OO$="A"
1157 GOTO1000
1159 IFU=0THEN300
1160 C=0:FORI=1TOU:IFD(I,2)<10THENM(D(I,0),0)=0:GOSUB9950:PRINTM$(V)" DEAD."
1170 IFD(I,2)<10ANDI=UTHENC=999:IFD(I,1)=5THENOO$="DEAD":TI$="000000"
1180 IFD(I,2)<10ANDI<>UTHENC=100
1190 IFD(I,2)<10THENPOKED(I,3),32:SC=SC+(D(I,2)+1)*10:GOSUB3660
1200 NEXT:IFC=999THENU=U-1:GOTO300
1210 IFC=0THEN300
```




```
1220 FORI=1TOU:POKED(I,3),32:NEXT:U=0:GOTO300
3000 I$="INVISIBLE":RETURN
3100 IN$="INVINCIBLE":RETURN
3200 GOSUB9900:PRINT"■■■■■THE NUMBER IS "LEFT$(CC$,1):RETURN
3300 S=100:RETURN
3400 W=0:RETURN
3500 IFRM<>7ORLE<>5OROO$<>"DEAD"ORPEEK(PO+B)<>171THENRETURN
3510 GOSUB9900:PRINT"■■■■■ENTER COMBINATION":M$(0)=""
3520 FORI=1TO5
3530 GETA$:IFA$=""THEN3530
3540 M$(0)=M$(0)+A$:NEXT
3550 IFCC$=M$(0)THENSTOP
3560 RETURN
3600 A$="NO":FORI=0TONM:IFLE=M(I,0)THENA$="STAFF GLOWS"
3610 NEXT:GOSUB9900:PRINT"■■■■■"A$:PRINT"Z":RETURN
3650 PRINT"■■                    ";:PRINT"■■STRTH"INT(S):PRINT"T"TAB(10)"WOUNDS
"INT(W)
3655 RETURN
3660 PRINT"■■■                    ";:PRINT"■■■WGHT "WT:PRINT"T"TAB(10)"SCORE"IN
T(SC):RETURN
3670 PRINT"■■■■                    ";:PRINT"■■■■ARROW"AA:PRINT"T"TAB(10)"ELIXIR
"EL:RETURN
3700 SH$="ON":RETURN
3800 IFRM<>7ANDLE<>5ANDOO$<>"DEAD"THENRETURN
3810 GOSUB9900:PRINT"■■■■■"RIGHT$(CC$,1):RETURN
3900 MA$="ON":RETURN
4000 IFPEEK(PO+B)=21THENPRINT"#":GOSUB3600:IFA$="NO"THENLE=LE+1:RM=0:PO=PO+1:A=1
14:B=22:Y=9:GOTO200
4010 IFPEEK(PO+B)=4THENLE=LE-1:RM=0:PO=PO-1:A=114:B=22:S=S-1:GOTO200
4020 GOTO300
9000 POKE36878,15:POKE36877,230:FORI=1TO100:NEXT:POKE36877,0:RETURN
9900 PRINT"■■■■■                    ";:RETURN
9950 PRINT"■■■■■■■■■■■■■■■■■■■■■
9960 PRINT"■■■■■■■■■■■■■■■■■■■■■";:RETURN
```

(continued from previous page)

room containing the safe, the last number in the combination is revealed to you.

9 Mask of Power — Subdues all goblins, vampires and trolls.

In order to open the safe, you must reach the Guardian's room, kill him, and then place the Key of Treasures in the lock, and enter the combination. The key is placed in the lock by facing the safe and typing U5. The combination is a five digit number. The first digit is obtained from the Glass of Prophecy, the next three on arrival at the top floor, and the last on the Guardian's death — as described above. The safe must also be opened within 30 seconds of the Guardian's death, or else the treasure turns to dust.

The following are the commands:

←(Stab)	stabs an enemy standing directly in front of you — several are needed.
1 (Walk)	Move forward one pace.
U (Use)	followed within 1 second by a number from 0 to 9, and then the corresponding item — see previous list — will be used. eg: U3 uses the Ring of healing. This must be renewed each time a new room is entered.
I (Inventory)	Tells you which items you are carrying — and can hence use.
O (Open)	Opens a door in front of you.
P (Put)	Followed within 1 second by a digit, and the corresponding item is placed on the floor on front of you.
S (Shoot)	Fire an arrow — several are required.
D (Drink)	Drinks an elixir which helps you to recover your strength and from wounds — but knocks 50 off your score.
L (Left)	Turns you left.
:	Turns you to face the opposite direction.
; (Right)	Turns you right.
G (Grab)	Grabs an object in front of you.

- * An item of treasure (0-9).
- ♤ A servant of the Guardian, or the Guardian.
- ⊞ The safe.
- × A door.
- ■ The wall.
- u Steps leading upstairs.
- d Steps leading downstairs.

■

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You can create up to 50 files on the cartridge – identified by titles of your own choice.

And when you want to display the data again, Microdrives give you lightning-fast access:

- Just 3.5 seconds to access a typical file.
- Only 9 seconds to LOAD a typical 48K program.

ZX Microdrives use the Spectrum's own power supply.

Your first Microdrive is connected to Interface 1 by a Microdrive lead. Then, up to 7 more Microdrives can be added using Microdrive connectors. That gives you a minimum of 680K bytes of on-line capacity.

With memory like that, the possibilities are limitless – stock control, word-processing, even huge adventure games!

With each Microdrive, you'll receive a Microdrive connector and Microdrive demonstration cartridge. Blank Microdrive cartridges cost £4.95 each. They are available in packs of 4 (with a free cartridge wallet) or singly.

ZX Interface 1 – the multi-purpose controller. £49.95

ZX Interface 1 is a multi-purpose device. It controls up to 8 Microdrives. And it adds file-handling and communication facilities to your Spectrum.

So in one low-priced unit, you also get these two built-in features:

- **RS232 interface** This industry standard interface allows you to link your Spectrum with full-size printers, communicate with other computers employing RS232, and transmit data over telephone lines via modems.
- **The ZX Net** Now you and your friends can transfer programs and data on a local area network – or even play computer games together.

The ZX Net makes it easy, and fast!

It links between 2 and 64 Spectrums, transmitting at 10,000 characters per second. (So a full screen is transferred in around 3 seconds!) With the ZX Net, only one person need type in a program. And a Microdrive or printer can be shared by everyone in the network!

ZX Interface 1 offers you all these facilities, and retains the same peripheral port as the Spectrum itself.

With each ZX Interface 1, you'll receive a connecting lead for the first Microdrive; a ZX Net lead with jack plugs, plus a comprehensive manual.

An RS232 lead is available as an optional extra at £14.95.

Available from: larger branches of Boots • WH Smith Computer Stockists • Greens Computer Centres • Spectrum Computer Stores • and larger branches of John Menzies • Dixons • Laskys • Currys • John Lewis Partnership • Rumbelows • British Home Stores • House of Fraser and many other good computer stockists nationwide.

Find out more – in your local shop!

The best way to evaluate ZX Microdrives and Interface 1 is to see them for yourself.

There is a full range of ZX peripherals – including ZX Interface 2 for joystick and ROM Cartridge capability, alongside the only computer that supports them – the ZX Spectrum!

For more information, telephone Sinclair Research Ltd, on 0276 685311.



Listing 1.

```
10PIX1=&80:PIX2=&81:BYTE=&82:MEM1=&8A
20FORI%=0 TO3 STEP3
30P%=&C20
40[OPTI%
50LDX #4:LDA #1:STA MEM1
60LDA #0:STA BYTE
70.LOOP
80LSR PIX2:BCC L1
90LDA MEM1:ORA BYTE:STA BYTE
100.L1
110ASL MEM1:LSR PIX1:BCC L2
120LDA MEM1:ORA BYTE:STA BYTE
130.L2
140ASL MEM1:DEX:BNE LOOP
145RTS:]
150NEXT
160VDU23,224,16,32,64,254,254,64,32,16
170VDU23,225,24,60,90,90,24,24,24,24
180VDU23,226,24,24,24,24,90,90,60,24
190VDU23,227,0,126,66,90,90,66,126,0
```

Listing 2.

```
  0REM LEFT SCROLL
  10SCRFROM=&70:SCRTO=&72:MEM1=&78:M
EM2=&79:MEM3=&7A
  20FORI%=0 TO2 STEP2
  30P%=&D25
  40[OPTI%
  50LDA &7:STA SCRTO+1:STA SCRFROM+1
  60LDA &6:STA SCRTO:LDA #32:CLC
  70ADC &6:STA SCRFROM:BCC L8
  80INC SCRFROM+1
  90.L8
 100LDA #8:STA MEM2
 110.L6
 120LDX #224
 130LDA #0:STA MEM1
 140.L1
 150LDY MEM1
 160LDA (SCRFROM),Y
 170STA (SCRTO),Y
 180INC MEM1
 190DEX:BNE L1
 200LDA #128:CLC:ADC SCRFROM:STA SCR
FROM:BCC L5:INC SCRFROM+1
 210.L5:INC SCRFROM+1:INC SCRFROM+1
 220LDA #128:CLC:ADC SCRTO:STA SCRTO
:BCC L7:INC SCRTO+1
 230.L7:INC SCRTO+1:INC SCRTO+1
 240DEC MEM2:BNE L6
 250RTS
 260]:NEXT
```

Listing 3.

```
  0REM RIGHT SCROLL
 10SCRFROM=&70:SCRTO=&72:
   MEM1=&78:MEM2=&79:MEM3=&7A
 20FORI%=0 TO2 STEP2
 30P%=&D75
 40[OPTI%
 50LDA &7:STA SCRTO+1:STA SCRFROM+1
 60LDA &6:STA SCRFROM:LDA #32:CLC
 70ADC &6:STA SCRTO:BCC L8
 80INC SCRTO+1
 90.L8
100LDA #8:STA MEM2
110.L6
120LDX #224
130LDA #223:STA MEM1
140.L1
150LDY MEM1
160LDA (SCRFROM),Y
170STA (SCRTO),Y
180DEC MEM1
190DEX:BNE L1
200LDA #128:CLC:ADC SCRFROM:STA
      SCRFROM:BCC L5:INC S
      CRFROM+1
210.L5:INC SCRFROM+1:INC SCRFROM+1
220LDA #128:CLC:ADC SCRTO:STA
      SCRTO:BCC L7:INC SCRTO +1
230.L7:INC SCRTO+1:INC SCRTO+1
240DEC MEM2:BNE L6
250RTS
260]:NEXT
```

Listing 4.

```
  0REM SWAP
 10DAT=&70:NCHR=&72:LP=&74:MEM1=&76
 20FORN%=0 TO3 STEP3:P%=&DC5
 30[OPTN%
 40LDA #246:STA DAT:LDA #13:STA DAT+1
 50LDY #2:STY LP:INY:STY LP+1
 60LDY #0
 70.LOOP1
 80LDA (NCHR),Y:TAX:LDA (DAT),Y
 90STA (NCHR),Y:TXA:STA (DAT),Y
100INC NCHR:BNE L1:INC NCHR+1
110.L1
120INC DAT:BNE L2:INC DAT+1
130.L2
140DEC LP:BNE LOOP1
150DEC LP+1:BNE LOOP1
160RTS
170]:NEXT
```

THIS PACKAGE, which is comparable to any on the market today, allows you first to define characters for Mode 2 — using all 16 colours — up to 21 by 21 pixels in size and then use these as interrupt-controlled sprites — they move independently of any programs also Running — which may be animated with up to 20 frames, be enlarged and shrunk to create 3D effects and which support full collision detection whereby a sprite may go into a termination sequence of frames, for example, on hitting another sprite.

If you have discs then you must revert to tapes as the disc memory space is used heavily by the system.

To type in the character definer first enter listing 1 and check it carefully. Save the program and Run it. If all is well type New as a direct command — do not perform a hard reset or switch off the computer — and enter, Save and Run listing 2. Type New and continue this process until listing 6. After Running this program type as a direct command

*SAVE"CODE" C00 + 1FF

Type New and type in listing 7 and Save it after checking. Run the program and save the code it produces using

*SAVE"CHARPRT" 1600 + FF

as a direct command. Now type New and enter listing 8. Save it and make a copy of Code and Charprt in that order just after it. Press Break and type in listing 9. Save this after Charprt and now the character definer is complete. To Run it Chain it from listing 8.

Now press Break and type

PAGE = &2000

and New as direct commands prior to typing in listing 10 which is the actual sprites routine. Check this very carefully, Save it and Run it. Now type New and enter listing 11, Save it and Run it. To save the code produced by these two programs use as direct commands:

*SAVE"SPRITES" E00 + 4FF

and

*SAVE"CHARVIEW" C00 + 30

Type New and enter and Save listing 12. After it make a copy of Sprites and Charview and the sprite definer is complete.

Follow the instructions on the screen to get the grid on which to draw the character. The movement keys — Z, X, / and : — move the cursor over the grid and the commands Fill — F — and Delete — D — cause the pixel under the cursor to take on the cursor's colour or become blank.

SCROLL: If your character is larger than 8 by 8 you can draw on the rest of the character by pressing S and using the movement keys to move the 8 by 8 window over the relevant part of the character.

Listing 8.

```
10MODE7
20PRINTTAB(9,1)CHR$130;STRING$(18,"_")
30FORN%=2 TO3:PRINTTAB(7,N%)CHR$141"
Character definer.":NEXT
40PRINTTAB(9,4)CHR$130;STRING$(18,"_")
45VDU28,11,22,30,20
50*LOAD"" C00
60*LOAD"" A00
70PAGE=&1700:CHAIN""
```

TURN: This rotates the character a quarter of a revolution anticlockwise but only if the character has equal height and width. If not this command does nothing.

REFLECT: If vertical half is selected this command copies the left half of the character on to the right and if horizontal half is selected the top half of the character is copied on to the bottom. If vertical whole is chosen the character inverts about a line vertically through its centre and if horizontal whole is chosen the character inverts about a line horizontally through its centre.

SWAP: Up to four characters may be held in memory simultaneously. Character 0 is the one you see and may alter but to operate on the other characters you may swap character 0 with characters 1 to 3.

When swapping always swap the character back to where it originated or you will lose track of it. For example, to operate on character 1 and then on character 2: Swap 0 and 1 — operate on character 1; Swap 0 and 1; Swap 0 and 2 — operate on character 2; Swap 0 and 2.

SAVE: Uncompiled — this saves character 0 so that it may be loaded using the program's Load routine so that it may be operated on later. Compiled — this saves the character in the shorter form used by the routine to print on to a Mode 2 screen. It also strips the character of any blank rows and columns before saving so it is always worth using a square character larger than needed to allow Turning so that you know excess rows and columns will not be saved with the compiled character.

After saving your characters note the order they are on the tape because when loading you will not be able to see the filename.

LOAD: This loads uncompiled code only into next free character space i.e., the one after the last one used. If all the characters are being used you will be prompted to enter which one you wish to overwrite, if any.

You are always prompted for the filename of the data to be loaded so always note this when saving a character.

QUIT: This quits on the current character

Listing 7.

```
  0REM CHARACTER PRINT
 10LB=&70:HB=&71:HT=&72:WD=&73
 20XC=&74:YC=&75:CRDAT=&76
 30MEM1=&78:MEM2=&79:MEM3=&7A:MEM4=&7B
 40MEM5=&7C
 50FORI%=0 TO3 STEP3:P%=&1600
 60[OPTI%
 70LDA 3574:STA WD:LSR WD:LDA 3575:STA HT
 80LDA #248:STA CRDAT:LDA #13:STA CRDAT+1
 90LDA #44:STA XC
100LDA #7:STA YC
110\ LD HIMEM
120LDA 6:STA LB:LDA 7:STA HB
130LDA #0:STA MEM1
140ASL XC:BCC L1
150INC MEM1
160.L1:ASL MEM1:ASL XC:BCC L2
170INC MEM1
180.L2:ASL MEM1:ASL XC:BCC L3
190INC MEM1
200.L3:LDA XC:CLC:ADC LB
210STA LB:BCC L6:INC MEM1
220.L6
230LDA MEM1:CLC:ADC HB:STA HB
240LDA YC:STA MEM1
250LSR MEM1:LSR MEM1:LSR MEM1
260LDA MEM1:STA MEM2
270LSR MEM2
280BCC M1
290LDA #128:CLC:ADC LB
300STA LB:BCC M1
310INC HB
320.M1:LDA MEM2:CLC:ADC HB
330STA HB:ASL MEM1
340LDA MEM1:CLC:ADC HB:STA HB
350LDA YC:AND #7
360CLC:ADC LB:STA LB:BCC L4
370INC HB
380.L4
390LDY #0:LDX HT
400STX MEM1:STY MEM2
410.N1:LDY #0:STY MEM3:LDX WD
420.N2:LDY MEM2
430LDA (CRDAT),Y:STA &80
440INY:LDA (CRDAT),Y:STA &81
450INC MEM2:INC MEM2
460BNE N6:INC CRDAT+1
```

and allows you to redefine its height and width.

After defining and saving your characters use the following commands after switching the machine on to enter the program that allows you to define sprites.

```
PAGE = &2000
NEW
LOAD"listing 12"
*LOAD"SPRITES"
RUN
```

This program first loads in the character data that you saved using the previous program so after typing Run — as shown above — place the cassette with the character data on it into your tape player and press play. The program will say at what location in memory it is going to load the character so note this next to the character's filename.

After loading a character the program will ask you if you wish to load any more characters or stop. Continue loading until you have all the characters you are going to use and then stop. You should now have a list like the one below:

FILENAME	ADDRESS
Alien 1	4864
Ship	4900
Fruit	4950
etc . . .	

Once you have finished loading you may enter lines which control the sprite. This is done by entering Data lines starting at line no. 2 and going up in increments of two, the last data line being DATA 100 ie.,

```
2 DATA . . .
4 DATA . . .
6 DATA . . .
8 DATA 100
```

Data lines may extend up to line 48 which, if used, must be Data 100.

The Data lines consist of numbers separated by commas each of which controls a particular aspect of the sprite's motion. Each Data line controls one sprite — see figure 1.

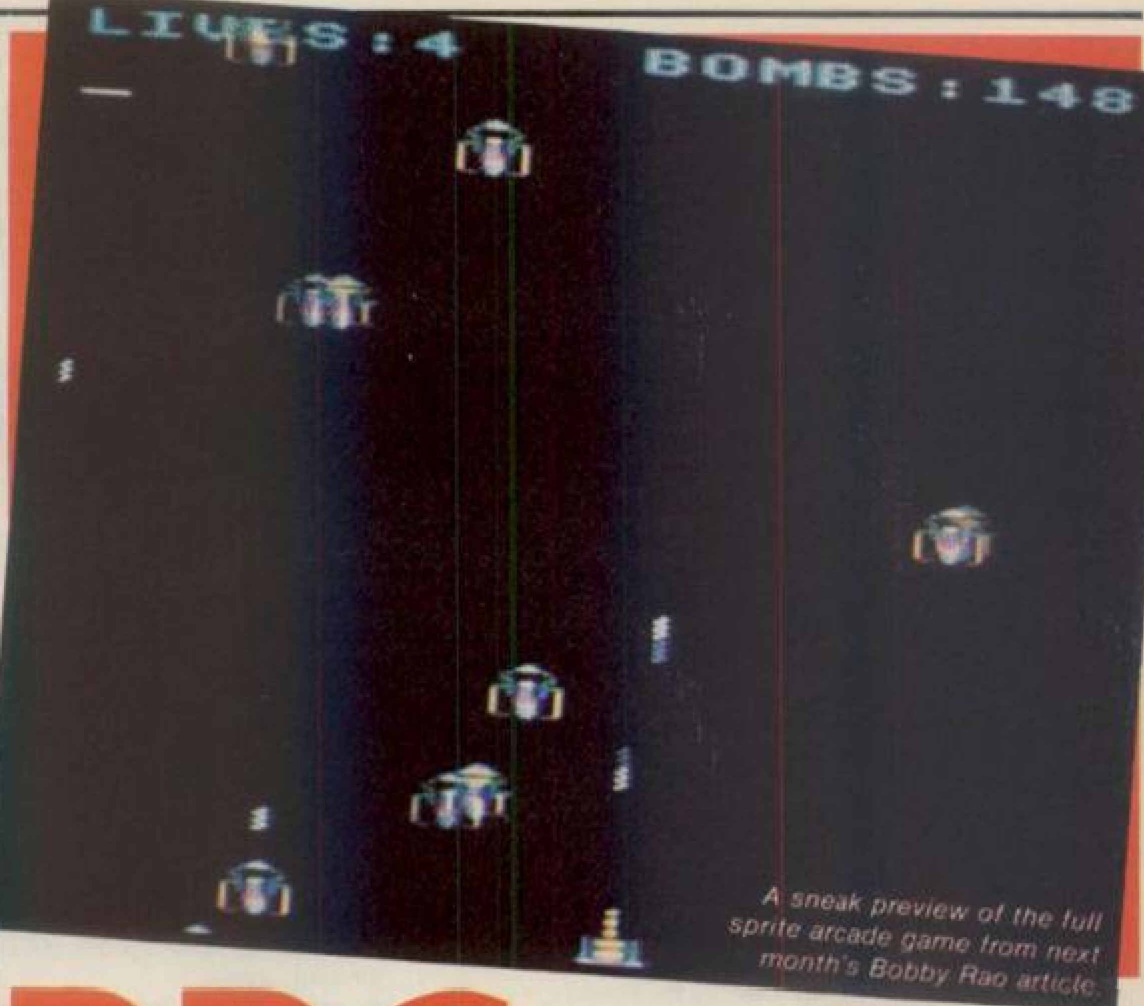
After number 20 enter in the order you wish to be displayed the addresses of characters that will make up the sprite followed by the addresses of the characters that will make up the termination sequence. Up to 20 addresses in total may be entered after number 20.

After entering the Data lines type as a direct command Goto 50. This will make code you may *Save which on *Loading later will give you your sprites ready to use in your own program.

After typing Goto 50 you will be prompted for a start address at which to place the code that controls the sprites. After you loaded the

(continued on next page)

```
470.N6
480STX MEM5
490JSR &C20:LDA &82
500LDX MEM5
510LDY MEM3:STA (LB),Y
520LDA #8:CLC:ADC MEM3:STA MEM3
530DEX:BNE N2
540INC YC:BNE R1:LDA HB:SEC:SBC #77:STA HB
       N5:DEC HB:BNE N5
550LDA LB:SEC:SBC #135:STA LB:BCS
560.R1:LDA #7:AND YC
570BNE N3
580LDA #121:CLC:ADC LB
590STA LB:BCC N4
600INC HB
610.N4:INC HB
620INC HB:BNE N5
630.N3
640INC LB:BNE N5
650INC HB
660.N5
670DEC MEM1:BNE N1
680RTS
690]:NEXT
```



A sneak preview of the full sprite arcade game from next month's Bobby Rao article.

BBC SPRITES

Full collision detection, animation and independent movement in part 1 of Bobby Rao's sprites package.

Listing 5.

```
LOAD

   0REM COMPILE
  10DAT=3574:CRDAT=&76:CRDAT1=&78
  20HT=&72:WD=&73:WD1=&74
  30DIS1=&70:CNT=&71
  40PXBT=&C20
  50PIX1=&80:PIX2=&81:BYTE=&82
  60DIS2=&85
  70FORN%=0 TO3 STEP3
  80P%=&C46
  90[OPTN%
 100LDA #248:STA CRDAT:STA CRDAT1::
 LDA #13:STA CRDAT+ 1:STA CRDAT1+1
 110LDA #2:STA CNT
 120LDA #0:STA DIS1
 130.L1
 140LDA #0:STA DIS2
 150.L2
 160LDY DIS2
 170LDA (CRDAT),Y:STA PIX1
 180INY:LDA (CRDAT),Y:STA FIX2
 190JSR PXBT
 200LDY DIS1:LDA BYTE:STA (CRDAT1),Y
 210INC DIS1
 220INC DIS2:INC DIS2:BNE L2
 230INC CRDAT+1
 240DEC CNT
 250BNE L1
 260LSR DAT
 270RTS
 280]:NEXT
```

Listing 6.

```
   0REM SHORTEN
  10HT1=&85:CRDAT=&76
  20HT=&72:WD=&73:WD1=&74
  30WDS=&78:WDF=&79:HTS=&7A:HTF=&7B
  40DIS1=&70
  50FORN%=0 TO3 STEP3
  60P%=&C83
  70[OPTN%
  80LDA 3574:STA WD1:LDA 3575:STA HT1
  90LDA #248:STA CRDAT:LDA #13:STA CRDAT+1
 100LDA #0:STA WDS:STA HTS
 110LDA WD1:STA WDF:LDA HT1:STA HTF
 120LDY #0
 130LDA HT1:STA HT
 140.J2
 150LDA WD1:STA WD
 160.J1
 170LDA (CRDAT),Y:BNE N1
 180INY:DEC WD:BNE J1
 190INC HTS:DEC HT:BNE J2
 200.N1
 210LDY #255
 220LDA HT1:STA HT
 230.K1
 240DEC HTF
 250LDA WD1:STA WD
 260.K2
 270LDA (CRDAT),Y:BNE N2
 280DEY:DEC WD:BNE K2
 290DEC HT:BNE K1
 300.N2
 310LDY #0:STY DIS1
 320LDA WD1:STA WD
 330.L1
 340LDY DIS1
 350LDA HT1:STA HT
 360.L2
 370LDA (CRDAT),Y:BNE N3
 380TYA:CLC:ADC WD1:TAY
 390DEC HT:BNE L2
 400INC DIS1
 410INC WDS:DEC WD:BNE L1
 420.N3
 430LDY WD1:DEY:STY DIS1
 440LDA WD1:STA WD
 450.M1
 460DEC WDF
 470LDY DIS1
 480LDA HT1:STA HT
 490.M2
 500LDA (CRDAT),Y:BNE N4
 510TYA:CLC:ADC WD1:TAY
 520DEC HT:BNE M2
 530DEC DIS1
 540DEC WD:BNE M1
 550.N4:RTS
 560]:NEXT
```

(continued from previous page)

code for the characters the program will have told you the next free address so enter this here. Also you will be prompted to enter the number of the first sprite so enter 1 here. To view your sprites use Goto 100 as a direct command.

Next month I will explain how sprites may be implemented in your own Basic programs and will give the listing for the fast arcade game shown on page 120. If you cannot be bothered to type in all the listings, they are available — together with the game — for £3.50 from B Bao, 12 Parkstone Close, Mowsbury Park, Bedford MK41 8BD.

Figure 1.

Position of number in Data line	Significance of number
1	Sets inital X-co-ordinate of sprite. This number can be between 0 — left-hand edge of screen — and 79 — right-hand edge of screen.
2	Sets constant X-axis displacement of sprite — i.e., distance it moves each time. Can be between −4 — left fast — and 4 — right fast.
3	Sets initial Y-co-ordinate of sprite. Can be between 0 — top of screen — and 255 — bottom.
4	Sets constant Y-axis displacement of sprite. Can be between −4 — up fast — and 4 — down fast.
5	Number of frames of animation of normal sprite. Must be 1 or more.
6	Number of frames of animation of sprite's termination sequence. Must be 1 or more. The above two numbers concern a facility that allows different characters to be displayed one after the other allowing animation.
7	Used internally. Set to 150.
8	Used internally. Set to 0.
9	Width magnification. Can be between 1 — normal width — and 4. When using this facility — i.e., when the number is larger than 1 — ensure that starting from the left edge of the character every pair of pixels is of the same colour.
10	Internal use — set to 0.
11	Height magnification. Can be between 1 and 4. Works with any character — the restrictions for width magnification do not apply.
12	Internal use — set to 0.
13	Magnification increment. This sets by how much the width and height magnifications will increase every time the sprite moves. If set to 0 the sprite stays the size it was initially. If set to 1 the sprite doubles in both dimensions each frame. If set to 2 the sprite quadruples in both dimensions each frame. If the value is 128+ increment, when the width or height magnifications exceed 4 the value for the increment becomes negative so the sprite grows smaller again.
14	X- and Y-axis bounce. This controls the action of the sprite when it reaches the screen's edge. (See table below.)
15	X-axis random displacement. This may be set between 0 — no random displacement — and 3 — large random displacement — and determines how large a random number should be added to the constant X-axis displacement each frame.
16	Y-axis random displacement. May be between 0 and 3.
17	Hit colours. May be set between 0 and 255 and controls which colours a sprite may crash into and which it may just pass through. If set to 0 a sprite goes through every colour but if 255 it goes into termination sequence on touching any colour except black. The best way to use this facility is to set it to 192 which causes the sprite to crash into any flashing colour but pass through the rest.
18	Termination sequence duration. When a sprite is in termination this value tells it how long to go on repeating its termination frames before disappearing. The value must be greater than 128 so to make a sprite repeat three frames 20 times as its termination sequence set this value to 128 + (3 × 20) = 188.
19	Internal use — set to 0.
20	Internal use — set to 0.
21	Set this to the address of the character to be displayed first i.e., frame one of the sprite.
22	This may either be set to the character that is displayed second — frame two — or if the sprite only has one frame to the address of the first frame of the termination sequence.

X-axis	Y-axis	Action
0	0	Crosses edge to reappear on other side — wrap-round
1	4	bounces off edge like a ball
2	8	stops at edge
3	16	goes into termination sequence

Hence if the value here is 9 the sprite bounces off vertical — X-axis — edges and stops at horizontal — Y-axis — edges as 9 = 1 + 8.

Listing 9.

```
5REM CHARACTER DEFINER
10*FX220,0
30DAT=3574:CHAR=3576:FREE=4088:FORN%=3576 TO5629 STEP4:!N%=0:NEXT
70MODE7
90PRINTTAB(8,1)CHR$141" Character definer."TAB(8,2)CHR$141" Character definer."TAB(9,3)CHR$133;STRING$(18,"_")
110PRINTTAB(0,5)"      Please enter EVEN WIDTH only."
130PRINTTAB(0,7)SPC(40)TAB(0,7)"Char. width (2 to 64) <RETURN> ";:INPUTWD%
150IFWD%<2 ORWD%>64 ORWD%AND1 GOTO130
170PRINTTAB(0,9)SPC(40)TAB(0,9)"Char. height (1 to ";:LL%=(513/WD%):IFLL%>64 LL%=64
190PRINT;LL%") <RETURN> ";:INPUTHT%:IFHT%<1 ORHT%>LL% GOTO170
200PRINTTAB(0,11)"Sound on (Y or N)?":REPEAT:?Q%=32:A$=GET$:UNTIL A$="Y" ORA$="N"
210IFA$="Y" SD%=-10 ELSESD%=0
230?DAT=WD%:DAT?1=HT%
250MODE2:VDU23;8202;0;0;0;
260WD%=?DAT:HT%=DAT?1:PROCMATRIX:PROCPIC
290CX%=0:CY%=0:CL%=0:SW%=0:CXO%=0:CYO%=0:CLO%=0:CCLO%=0:PX%=0:X%=0:Y%=0
370PROCLIN
390REPEAT:PROCCURSOR:PROCKEY:COLOUR128:PRINTTAB(0,28);SPC(40);:UNTILSW%
470ON SW% GOTO70,250
490DEFPROCMATRIX
530FORN%=0 TO7:PRINTTAB(8,N%)CHR$(49+N%)TAB(N%,8)CHR$(65+N%):NEXT
550PRINTTAB(0,12);"Pixl";TAB(0,14);"Curs":PROCAROWCOL(0):PRINTTAB(4,13)CHR$227;FORN%=1 TO15:COLOURN%+128:PRINTTAB(N%+4,13);" ";:NEXT:COLOUR128:COLOUR6
630PRINTTAB(1,16)";-Up /-Down Q-Quit"TAB(3,18)"Z-Left X-Right"TAB(2,20)"F-Fill  D-Delete"TAB(2,22)"W-Swap O-Colour"TAB(1,24)"R-Reflect S-Scroll"TAB(0,26)"T-Turn L-Load V-Save"
690GCOL0,6:MOVE704,960-HT%*4:DRAW704,988-HT%*4:MOVE696+WD%*8,960-HT%*4:DRAW696+WD%*8,988-HT%*4:MOVE712+WD%*8,992:DRAW752+WD%*8,992:MOVE712+WD%*8,996-HT%*4:DRAW752+WD%*8,996-HT%*4
750ENDPROC
770DEFPROCGRID
810F1%=7:F2%=7
830IFWD%<8 F1%=WD%-1
850IFHT%<8 F2%=HT%-1
870BT%=FNBT:FORN%=0 TOF2%:FORM%=0 TOF1%
890COLOUR128+BT%?M%:PRINTTAB(M%,N%)" ";:NEXT:BT%=BT%+WD%:NEXT
910COLOUR128:COLOUR7
930ENDPROC
950DEFPROCLIN
970GCOL3,7
1010PL%=704+X%*8:MOVEPL%,1012:DRAWPL%,1000:MOVEPL%+56,1012:DRAWPL%+56,1000:PL%=992-Y%*4:MOVE664,PL%:DRAW688,PL%:MOVE664,PL%-28:DRAW688,PL%-28
1050ENDPROC
1070DEFPROCPIC
1090PROCGRID
1130CALL &A00:ENDPROC
1170DEFPROCUP
1210VDU28,0,7,7,0:PRINTTAB(0,0);CHR$11:VDU28,0,31,19,0:Y%=Y%-1:BOT%=FNBT
1290FORN%=0 TO7:COLOUR128+BOT%?N%:PRINTTAB(N%,0);" ";:NEXT
1310ENDPROC
1330DEFPROCDOWN
1350VDU28,0,7,7,0:PRINTTAB(0,7):VDU28,0,31,19,0:Y%=Y%+1:BOT%=FNBT+WD%*7
1450FORN%=0 TO7:COLOUR128+BOT%?N%:PRINTTAB(N%,7);" ";:NEXT
1470ENDPROC
1490DEFPROCLEFT
1530X%=X%-1:BOT%=FNBT:CALL &875
1570FORN%=0 TO7:COLOUR128+BOT%?(N%*WD%):PRINTTAB(0,N%);" ";:NEXT
1590ENDPROC
1610DEFPROCRIGHT
1650X%=X%+1:BOT%=FNBT+7:CALL &825
1690FORN%=0 TO7:COLOUR128+BOT%?(N%*WD%):PRINTTAB(7,N%);" ";:NEXT
1710ENDPROC
1730DEFPROCCURSDL
1750COLOUR128:PRINTTAB(9,CYO%);" "TAB(CXO%,9);" "TAB(CLO%+4,14);" "TAB(CCLO%+4,12);" ";:COLOUR128+PX%:PRINTTAB(CXO%,CYO%);" "
1790ENDPROC
1810DEFPROCCURSOR
1850PROCCURSDL:PROCAROWCOL(CL%)
1870PRINTTAB(9,CY%);CHR$224;TAB(CX%,9);CHR$225;TAB(CL%+4,14);CHR$225;TAB(0,14);"Curs"
1930COLOUR128+?FNBYTE:IFCL%=0 COLOUR135:COLOUR?FNBYTE
1970PRINTTAB(CX%,CY%);CHR$227:CCL%=?FNBYTE:PROCAROWCOL(CCL%):PRINTTAB(CCL%+4,12);CHR$226;TAB(0,12);"Pixl"
2050COLOUR128:COLOUR7:CXO%=CX%:CYO%=CY%:CLO%=CL%:CCLO%=CCL%
2070ENDPROC
2090DEFPROCAROWCOL(C%)
2130IFC% COLOUR128 ELSECOLOUR135
2150COLOURC%:ENDPROC
2190DEFPROCKEY
2210B$="ZX;/OFDSRTWLVQ"
2230REPEAT
2250?Q%=32:*FX15,1
2270A$=GET$
2290UNTILINSTR(B$,A$)>0
2310PRINTTAB(0,28);:PX%=?FNBYTE
2320SOUND1,SD%,(X%+CX%)*4,1:SOUND1,SD%,(Y%+CY%)*4,1
2350IFA$="Z" ANDCX%>0 CX%=CX%-1:ENDPROC
2370IFA$="X" ANDCX%<WD%-1 ANDCX%<7 CX%=CX%+1:ENDPROC
2390IFA$=";" ANDCY%>0 CY%=CY%-1:ENDPROC
2410IFA$="/" ANDCY%<HT%-1 ANDCY%<7 CY%=CY%+1:ENDPROC
2430IFA$="O" PROCCL:ENDPROC
2450IFA$="F" ?FNBYTE=CL%:PROCPLT(CL%):ENDPROC
2470IFA$="D" ?FNBYTE=0:PROCPLT(0):ENDPROC
2490IFA$="S" PROCSCR:ENDPROC
2510IFA$="R" PROCREF:ENDPROC
2530IFA$="T" PROCTURN:ENDPROC
2550IFA$="W" PROCSWAP:ENDPROC
2570IFA$="L" PROCLD:ENDPROC
2590IFA$="V" PROCSV:ENDPROC
2610IFA$<>"Q" ENDPROC
2615PRINT" You sure (Y or N)?":REPEAT:?Q%=32:A$=GET$:IF A$="Y" FORN%=3574 TO4087:?N%=0:NEXT:SW%=1:ELSE UNTIL A$="N"
2620ENDPROC
2670DEFPROCCL
2710PRINT"Use 'Z' and 'X' keys 'C' to return."
2730REPEAT:?Q%=32
2750*FX15,1
2760A$=GET$:SOUND1,SD%,CL%*16,1
2770IFA$="Z" ANDCL%>0 CL%=CL%-1
2790IFA$="X" ANDCL%<15 CL%=CL%+1
2810PROCCURSOR
2830UNTILA$="C"
2850ENDPROC
2870DEFPROCSCR
2890PRINT" Use Z , X , ; , /"'"   'C' to return.":PROCCURSDL
2930REPEAT:?Q%=32:A$=GET$:*FX15,1
2950PROCLIN:SOUND1,SD%,(X%+CX%)*4,1:SOUND1,SD%,(Y%+CY%)*4,1
2970IFA$="Z" ANDX%>0 PROCLEFT
2990IFA$="X" ANDX%<WD%-8 PROCRIGHT
3010IFA$=";" ANDY%>0 PROCUP
3030IFA$="/" ANDY%<HT%-8 PROCDOWN
3050PROCLIN
3070UNTILA$="C"
3090PROCGRID:ENDPROC
3130DEFPROCREF
3170COLOUR7:PRINTTAB(0,28)"Horizontally (H) or    Vertically (V)?    'C' to return.":REPEAT:?Q%=32:A$=GET$:UNTILA$="H" ORA$="V" ORA$="C":IFA$="C" ENDPROC
3190PRINTTAB(0,28)SPC(59)TAB(0,28)"Whole(W) or Half(H)?";:REPEAT:?Q%=32:C$=GET$:UNTILC$="W" ORC$="H"
3210PRINTTAB(0,28)SPC(40)TAB(0,28);:COLOUR2:IFC$="W" PRINT"Whole "; ELSEPRINT"Half ";
3230IFA$="V" GOTO3290
3250COLOUR2:PRINT"Horizontally.":FORN%=0 TOHT%/2-1:BQ1%=CHAR+N%*WD%:BQ2%=CHAR+(HT%-N%-1)*WD%:FORM%=0 TOWD%-1:IFC$="W" BQ%=BQ1%?M%:BQ1%?M%=BQ2%?M%:BQ2%?M%=BQ%:ELSE BQ2%?M%=BQ1%?M%
3270NEXT:NEXT:GOTO3330
3290COLOUR2:PRINT"Vertically (V)":FORN%=0 TOWD%/2-1:BQ1%=CHAR+N%:BQ2%=CHAR+(WD%-N%-1):FORM%=0 TO(HT%-1)*WD% STEPWD%:IFC$="W" BQ%=BQ1%?M%:BQ1%?M%=BQ2%?M%:BQ2%?M%=BQ%:ELSE BQ2%?M%=BQ1%?M%
3310NEXT:NEXT
3330PROCPIC:GOTO3170
3350DEFPROCTURN
3370IFWD%<>HT% COLOUR1:PRINT"Character not square":A$=INKEY$(100):ENDPROC
3390TB%=CHAR:WD1%=WD%:TX%=WD1%-1
3410PRINTSPC(6)"Turning."
3430REPEAT:TF%=TX%-1
3450FORN%=0 TOTF%:?(&900+N%)=TB%?N%:NEXT
3470FORN%=0 TOTX%:TB%?N%=?(TB%+TX%+N%*WD1%):NEXT
3490FORN%=1 TOTX%:?(TB%+TX%+N%*WD1%)=?(TB%+TX%*WD1%+TX%-N%):NEXT
3510IFTF%<1 GOTO3550
3530FORN%=1 TOTF%:?(TB%+TX%*WD1%+N%)=?(TB%+N%*WD1%):NEXT
3550FORN%=0 TOTF%:?(TB%+(TF%-N%+1)*WD1%)=?(&900+N%):NEXT
3570TB%=TB%+WD1%+1:TX%=TX%-2:UNTILTX%<1
3590PROCPIC:ENDPROC
3630DEFPROCSWAP
```

(continued on page 124)


SABRE WULF

(Listing 9 continued from page 122)

```
3650SW%=1:PRINT"Which character to swap with (0 to 3)?"
3670REPEAT:?D%=32:N%=GET:UNTILN%>47 ANDN%<52:FR%=DAT+(N%-48)*514
3690PROCDOK(&72,FR%):CALL&DC5
3710IF?DAT SW%=2
3730X%=0:Y%=0:ENDPROC
3750DEFPROCLD:FR1%=0
3790IFFREX<5600 GOTO3810 ELSEPRINT"Over which char(0 to 3 or 4 to return)":REPEAT:FR%=GET:UNTILFR%>47 ANDFR%<53
3800IFFR%=52 ENDPROC ELSEFRE%=DAT+(FR%-48)*514:FR1%=1
3810PROCDOK(&72,FRE%):CALL&DC5
3820FORN%=0 TO&FF:?(&900+N%)=?(&A00+N%):NEXT
3830X=OPENUPFNNME:FORN%=3574 TO4087:?N%=BGET#X:NEXT:CLOSE#X
3840FORN%=0 TO&FF:?(&A00+N%)=?(&900+N%):NEXT
3850PROCDOK(&72,FRE%):CALL&DC5:SW%=2
3870IFFR1% FRE%=5700 ELSEFRE%=FRE%+514
3890ENDPROC
3910DEFPROCSV
3950PRINT"SAVE compiled (C) oruncompiled (U)?"
3970REPEAT:?D%=32:A$=GET$:UNTILA$="C" ORA$="U":PRINTTAB(0,28)SPC(40);:IFA$="U" GOTO4050
3990?&86=(WD%/2*HT%)-1:CALL &C46:IF?&7A>?&7B ENDPROC
4010X=OPENOUTFNNME:BPUT#X,?&79-?&78+1:BPUT#X,?&7B-?&7A+1:FORN%=?&7A TO?&7B:FORM%=?&78 TO?&79:BPUT#X,?(CHAR+(N%*WD%/2)+M%):NEXT:NEXT:FORN%=3574 TO4087:?N%=0:NEXT:SW%=1:GOTO4055
4050X=OPENOUTFNNME:FORN%=3574 TO4087:BPUT#X,?N%:NEXT
4055CLOSE#X:ENDPROC
4060DEFFNNME:PRINTTAB(0,28)SPC(59)TAB(0,28)"Enter filename (max.10 chars.) <RETURN>.":VDU28,0,31,19,30:REPEAT:INPUTB$:UNTILB$>"":VDU28,0,31,19,0
4070PRINTTAB(0,28)SPC(60)TAB(0,28);:=MID$(B$,0,10)
4100DEFPROCPLT(C%)
4110GCOL0,C%:PLOT69,704+(X%+CX%)*8,992-(Y%+CY%)*4:ENDPROC
4150DEFFNBYTE=FNBT+CX%+WD%*CY%
4190DEFFNDEK(DK%)=?DK%+256*DK%?1
4230DEFPROCDOK(DK%,K%):?DK%=K%MOD256:DK%?1=K%DIV256
4240ENDPROC
4290DEFFNBT=CHAR+X%+Y%*WD%
```

Listing 10.

```
10O=&D00:ST=&E00
30LB=&70:HB=&71:HT=&72:WD=&73:XC=&74:YC=&75:C=&76:MEM1=&78:MEM2=&79:MEM3=&7A:MEM4=&7B
50TEMP=&7C:TEMP1=&7D:LB1=&7E:HB1=&7F:XC1=&80:YC1=&81:HT1=&82:WD1=&83:XXT=&84:YXT=&85:YXT1=&86
70XTWD=&87:XTHT=&88:XD=&89:F=&8A:RX=&8B:RY=&8C:CNT=&8D:FRQ=&8E:SRN=&8F
90?F=1:?CNT=0:?SRN=0:?FRQ=1
110FORI%=0 TO3 STEP3:P%=ST
130[OPTI%
150LDA S+19:STA C+1:LDA S+18:SEC:SBC #2:STA C
170BCS W10:DEC C+1
190.W10
210JSR DRW
230LDA S+10:STA YXT
250LDA S+6:CMP #150:BNE ABC2
270JMP ABC5
290.ABC2
310STA XC:LDA S+7:STA YC
330LDA S+9:STA XXT:LDA S+11:STA YXT
350LDA S+16:STA TEMP
370LDA #0:STA S+16
390JSR DRT
410LDA TEMP:STA S+16
430LDA S+17:BNE W20
450LDA #128:STA MEM1:RTS
470.W20:LDA S+12:AND #254:BEQ W1:BMI W2
490.W3
510ASL S+8:ASL S+10
530JMP W1
550.W2:LSR S+8:LSR S+10
570BNE W1
590LDA #1:STA S+8:STA S+10
610LDA S+12:AND #1:BEQ W1
630ORA #3:STA S+12
650JMP W3
670.W1
690.ABC5
710LDA S+17:AND #128:BNE ABC7
730DEC S+17:LDA S+4:CLC:ADC S+4
750LDY F:ASL F:CLC:ADC F:TAX:LDA S+18,X
770STA C:INX:LDA S+18,X:STA C+1
790INY:STY F
810LDA S+5:CMP F
830BCS ABC6
850LDA #1:STA F:JMP ABC6
870.ABC7
890ASL F:LDX F:LDA S+18,X
910STA C:INX:LDA S+18,X:STA C+1
930INX:STX F:LSR F
950LDA S+4:CMP F
970BCS ABC6
990LDA #1:STA F
1010.ABC6
1030JSR DRW
1040LDA C:STA S+18:LDA C+1:STA S+19
1050LDA &FE69:AND S+14:STA MEM4
1070LDA &FE68:AND S+14
1090CLC:ADC S+1:SEC:SBC MEM4:STA XD
1110LDA S+8:STA XXT:LDA S+10:STA YXT
1130LDA #0:TAX:STA MEM3
1150.P1
1170CLC:ADC WD:INX
1190CPX XXT:BNE P1
1210STA XTWD:STA MEM1
1230CMP #31:BCC W4
1250LDA #1:STA MEM3
1270LDA S+12:AND #254:BMI W4
1290LDA S+12:AND #1:BEQ W5
1310ORA #128:STA S+12
1330JMP W4
1350.W5:AND #1:STA S+12
1370.W4
1390LSR MEM1
1410LDA WD:STA MEM2:LSR MEM2
1430LDA MEM2:SEC:SBC MEM1:STA TEMP1
1450LDA S:CLC:ADC XD
1470CLC:ADC TEMP1
1490.F9
1510STA S
1530ASL S:STA S:BCC F1
1550CLC:ADC #80:STA S
1570.F1
1590LDA S
1610CMP #160:BCS F2
1630CMP #79:BEQ F2:BCC F2
1650SEC:SBC #80:STA S
1670.F2
1690\ X BOUNCE
1710LDA S+13:AND #3:BEQ ABC3
1730LDA XD:BEQ ABC3
1750LDA S:CLC:ADC #4
1770CMP #78:BCS B3
1790LDA S:CLC:ADC XTWD:CMP #80:BCS B3
1810JMP ABC3
1830.B3
1850LDA S:SEC:SBC XD:STA S
1870LDA S+13:AND #3:CMP #2:BNE J1
1890JSR HLT
1910LDA S:JMP F9
1930.U1
1950CMP #3:BNE U2
1970JSR TERM
1990BNE ABC3
2010.U2
2030LDA S:SEC:SBC XD:STA S
2050LDA #0:SEC:SBC S+1:STA S+1
2070LDA S:JMP F9
2090.ABC3
2110LDA &FEA9:AND S+15:STA MEM4
2130LDA &FEA8:AND S+15
2150CLC:ADC S+3:SEC:SBC MEM4:STA XD
2170LDA #0:TAX
2190.P2
2210CLC:ADC HT:INX
2230CPX YXT:BNE P2
2250STA XTHT:STA MEM1
2270CMP #63:BCC W7
2290LDA MEM3:BNE W7
2310LDA S+12:AND #1:BEQ W6
2330ORA #128:STA S+12
2350JMP W7
2370.W6:ORA #1:STA S+12
2390.W7
2410LSR MEM1
2430LDA HT:STA MEM2:LSR MEM2
2450LDA MEM2:SEC:SBC MEM1:STA TEMP
2470LDA S+2:CLC:ADC XD
2490CLC:ADC TEMP
2510STA S+2
2530\ Y BOUNCE
2550LDA S+13:AND #12:BEQ ABC1
2570LDA XD:BEQ ABC1
2590LDA S+2
2610CLC:ADC #4
2630BCS B1
2650LDA S+2
2670CLC:ADC XTHT:BCS B1
2690JMP ABC1
2710.B1
2730LDA S+2:SEC:SBC XD
2750STA S+2
2770LDA S+13:AND #12:CMP #8:BNE U3
2790JSR HLT:JMP ABC1
2810.U3
2830CMP #12:BNE U4
2850JSR TERM
2870BNE ABC1
2890.U4
2910LDA S+2:SEC:SBC XD:STA S+2
2930LDA #0:SEC:SBC S+3:STA S+3
2950.ABC1
2970LDA S+8:STA XXT:STA S+9
2990LDA S+10:STA YXT:STA S+11
3010LDA S:STA XC:STA S+6
3030LDA S+2:STA YC:STA S+7
3050JSR DRT
3070LDA S+2:SEC:SBC TEMP
3090STA S+2
3110LDA S:SEC:SBC TEMP1
3130STA S
3150LDA #0:STA MEM1:RTS
3170.DRT
3190LDA YC:STA YC1:LDA XC:STA XC1
3210BPL L0:LDA #0:STA XC
3230LDA S+2:SEC:SBC XD:SEC:SBC XD:STA S+2
3250LDA #0:SEC:SBC S+2:STA S+7
3270.L0
3290\ LB HIMEM
3310LDA 6:STA LB:LDA 7:STA HB
3330LDA #0:STA MEM1
3350ASL XC:BCC L1
3370INC MEM1
3390.L1:ASL MEM1:ASL XC:BCC L2
3410INC MEM1
3430.L2:ASL MEM1:ASL XC:BCC L3
3450INC MEM1
3470.L3:LDA XC:CLC:ADC LB
3490STA LB:BCC LA:INC MEM1
3510.LA
3530LDA MEM1:CLC:ADC HB:STA HB
3550LDA YC:STA MEM1
3570LSR MEM1:LSR MEM1:LSR MEM1
3590LDA MEM1:STA MEM2
3610LSR MEM2
3630BCC M1
3650LDA #128:CLC:ADC LB
3670STA LB:BCC M1
3690INC HB
3710.M1:LDA MEM2:CLC:ADC HB
3730STA HB:ASL MEM1
3750LDA MEM1:CLC:ADC HB:STA HB
3770LDA YC:AND #7
3790CLC:ADC LB:STA LB:BCC L4
3810INC HB
3830.L4
3850LDA HT:STA HT1
3870LDA #0:STA MEM1
3910.N11:LDA YXT:STA YXT1
3930.N1
3950LDA #0:STA MEM2
3970LDA LB:STA LB1:LDA HB:STA HB1
3990LDA WD:STA WD1
4010LDA XC1:STA XC
4030.N10
4050LDX XXT
4070.N2
4090LDA XC:CMP #80:BNE N5
4110LDA LB1:CLC:ADC MEM2:STA LB1
4130BCC N7:INC HB1
4150.N7
4170LDA LB1:SEC:SBC #128:STA LB1
4190LDA HB1:SBC #2:STA HB1
4210LDA #0:STA MEM2
4230.N5
4250LDY MEM1
4270LDA (C),Y
4290STA MEM4
4310BEQ H1
4330LDA S+16:BEQ H1
4350LDY MEM2:AND (LB1),Y
4370BEQ H1
4390LDA S+17:AND #127
4410BEQ H2
4430JSR TERM
4450BNE H1
4470.H2
4490JSR HLT
4510.H1
4530LDA MEM4
4550LDY MEM2
4570EOR (LB1),Y:STA (LB1),Y
4590TYA:CLC:ADC #8:STA MEM2
4610BNE N8:INC HB1
4630.N8
4650INC XC
4670DEX:BNE N2
4690INC MEM1
4710DEC WD1:BNE N10
4730.N6
4750INC YC1:BNE N14
4770LDA LB:SEC:SBC #135:STA LB
4790LDA HB:SBC #77:STA HB
4810JMP N4
4830.N14:LDA #7:AND YC1
4850BNE N3
4870LDA LB:CLC:ADC #121:STA LB
4890LDA HB:ADC #2:STA HB
4910BNE N4
4930.N3
4950INC LB:BNE N4
4970INC HB
4990.N4
5010DEC YXT1:BEQ N12
5030LDA MEM1:SEC:SBC WD:STA MEM1
5050JMP N1
5070.N12
5090DEC HT1
5110BEQ RT
5130JMP N11
5150.RT
5170RTS
5190.DRW:LDY #0:LDA (C),Y:STA WD:INY:LDA (C),Y:STA HT
5210LDA C:CLC:ADC #2:STA C:LDA C+1:ADC #0:STA C+1:RTS
5230.TERM:LDA S+17:CMP #128:BCS T1:RTS
5250.T1:AND #127:STA S+17:JSR H.T:LDA #1:STA F:RTS
5270.HLT:LDA #0:STA S+1:STA S+3:STA S+14:STA S+15:RTS
5410]:NEXT
```

Listing 11.

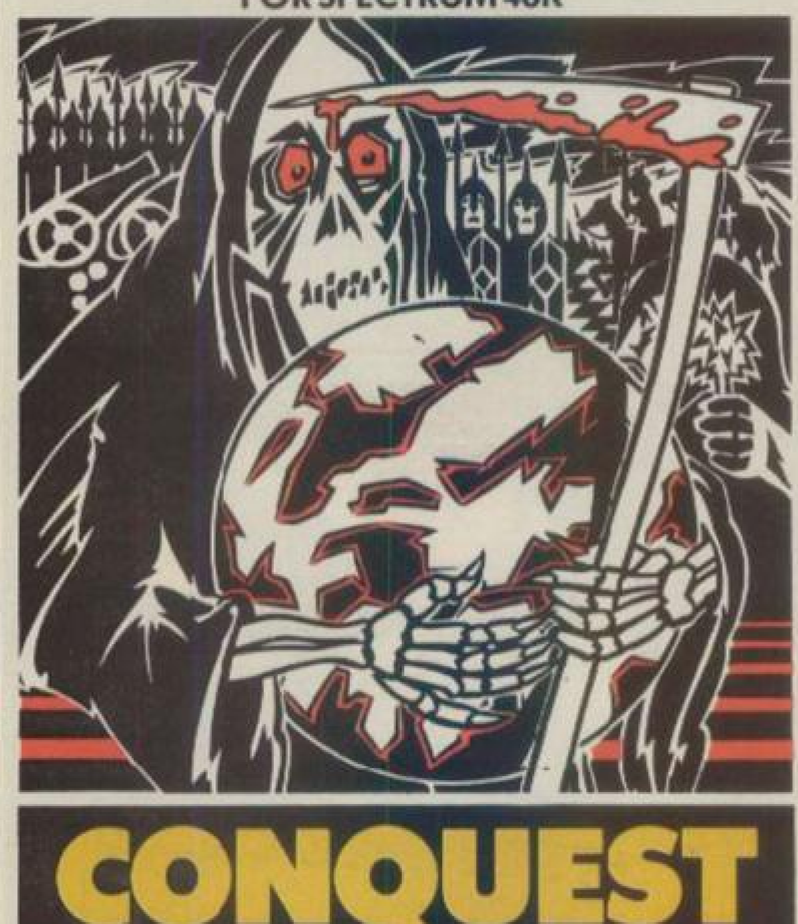
```
10S=&B00:ST=&12AF
30LB=&70:HB=&71:HT=&72:WD=&73:XC=&74:YC=&75:C=&76:MEM1=&78:MEM2=&79:MEM3=&7A:MEM4=&7B
50TEMP=&7C:TEMP1=&7D:LB1=&7E:HB1=&7F:XC1=&80:YC1=&81:HT1=&82:WD1=&83:XXT=&84:YXT=&85:YXT1=&86
70XTWD=&87:XTHT=&88:XD=&89:F=&8A:RX=&8B:RY=&8C:CNT=&8D:FRQ=&8E:SRN=&8F
90?F=1:?SRN=0
110FORI%=0 TO3 STEP3:P%=ST
130[OPTI%
150.HND:STX RX:STY RY:DEC CNT:LDA CNT:BNE Z5:LDA FRQ:STA CNT:LDA &D3F:CMP &D3E:BEQ Z5
170LDA SRN:STA MEM2:INC SRN:LDA SRN:CMP &D3E:BCC Z2:LDA #0:STA SRN
190.Z2:ASL MEM2:ASL MEM2:LDY MEM2:LDA &D40,Y:CMP #12:BCS Z5
210.Z1:AND #127:TAX:LDA &D41,Y:STA C:LDA &D42,Y:STA C+1:LDA &D43,Y:STA F:LDY #0
230.Z3:LDA (C),Y:STA &D00,Y:INY:DEX:BNE Z3
250LDA MEM2:PHA
270JSR &E00:PLA:TAY:LDA F:STA &D43,Y:LDA &D40,Y:ORA MEM1:STA &D40,Y:AND #127:TAX
290LDA &D41,Y:STA C:LDA &D42,Y:STA C+1:LDY #0
310.Z4:LDA &D00,Y:STA (C),Y:INY:DEX:BNE Z4
330LDA MEM1:CMP #128:BNE Z5:INC &D3F
370.Z5:LDA #0:STA &FEA8:LDA #10:STA &FEA9
390LDX RX:LDY RY:LDA &FC:RTI
410]:P%=&C00
430[OPTI%
450.PRT:LDY #0:LDA (C),Y:STA WD:INY:LDA (C),Y:STA HT
470LDA C:CLC:ADC #2:STA C:BCC PR1:INC C+1
490.PR1:LDA XC:STA &D00:LDA YC:STA &D02
510LDY #1:STY &D10:STY &D11:STY XXT:STY YXT
530JSR &E00:RTS
550]:NEXT
```

Listing 12.

```
49PROCLD:PRINT"Now enter lines of DATA starting with lines 2,4,...and ending with DATA100":STOP
50IFI%<&1300 I%=&1300
51REPEAT:INPUT"Start address for sprite data="D%
52UNTILD%>=I% ANDD%<8170:S%=D%
53REPEAT:INPUT"First sprite no.="D%:UNTILD%>0 ANDD%<48:D%=D%-1
54C%=0
55RESTORE(2+C%*2):?(&D41+D%*4)=S% MOD256:?(&D42+D%*4)=S% DIV256:B%=S%
60FORN%=0 TO19:READA%:?(S%+N%)=A%:NEXT
65S%=S%+N%
70READA%:IF A%<256 GOTO80
75?S%=A% MOD256:S%?1=A% DIV256:S%=S%+2:GOTO70
80?(&D40+D%*4)=S%-B%:?(&D43+C%+D%*4)=1:D%=D%+1:C%=C%+1:IFA%<>100 GOTO55
90?&D3E=D%:?&D3F=0
91PRINT"No. of sprites used=";D%
92PRINT"Next free address=";S%
95PRINT"Now use the following line to SAVE your sprites."'''"*SAVE'<filename>' D3E ";~S%'
97STOP
100?&BA=1:?&BF=0:?&BE=1
110MODE2
120?&FE6E=&1F:?&FE6D=&E0:?&FE6E=&E0
130?&FE6B=(?&FE6B)AND&BF
140?&FE68=0:?&FE69=30
150?&206=&4F:?&207=&12
160REPEAT:UNTIL?&D3F=?&D3E ORINKEY(-99)
170?&FE6E=?&FE6E AND127:STOP
180DEFPROCLD
190I%=&1300
200REPEAT:PRINT"Loading at ";I%
210X%=OPENUP"":REPEAT:?I%=BGET#X%:I%=I%+1:UNTILEOF#X%:CLOSE#X%
220PRINT"Waiting-any key to load more,'@' to stop"
230G=GET:UNTILG=64
240PRINT"Stopped - next address after character data=";I%
250ENDPROC
```



FOR SPECTRUM 48K



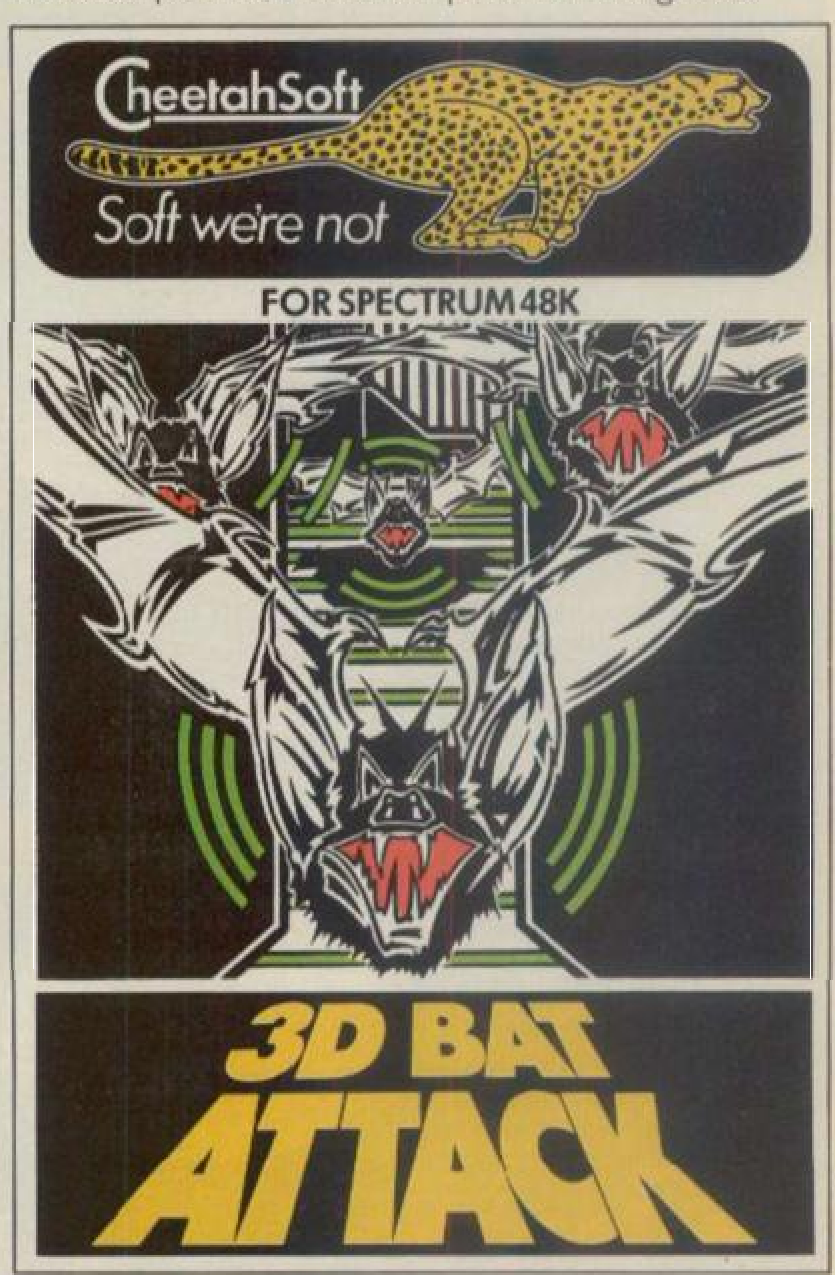
CONQUEST A tactical game which even veteran players will find both challenging and rewarding.

Mediterranean Europe is divided into grid squares. Your aim, as Emperor, is to gain 100 squares of territory as quickly as possible – at the same time dealing with Barbarian counter-attacks, plagues, civil war and rival Emperors.

5 levels of skill, plus a continuous 'Conquest' game where all the difficulty levels are thrown in together.

3D BAT ATTACK An all action, 3 dimensional maze game where you gather up blocks of gold, at the same time pitting your wits against vicious vampire bats whose only purpose in life is to locate, hunt and kill you.

4 levels of skill. At each level the game gets faster and more complicated, and the vampires more dangerous.



AFTER THESE, THE REST IS KIDS STUFF.

Are you ready for CheetahSoft?
There's only one way to find out.
But be warned: these vampire bats know a good meal when they see one. And our friend with the scythe has had years of experience . . .

So don't play unless you're ready to play the game for real. Because you'll find there's one sure thing about CheetahSoft: Soft we're not.

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Soft we're not

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(Monitor listing continued from previous page)

280	'N	9	0	3	5	7	9
290	'----------------------						
300	'0000		X				
310	'0200	X	X				
320	'0400						
330	'0600	X					
340	'0800		X	X			
350	'0A00	X	X	X			
360	'0C00			X			
370	'0E00	X		X			
380	'1000		X		X		
390	'1200	X	X		X		
400	'1400				X		
410	'1600	X			X		
420	'1800		X	X	X		
430	'1A00	X	X	X	X		
440	'1C00			X	X		
600	'3C00			X	X	X	
610	'3E00	X		X	X	X	
620	'4000		X				X
630	'4200	X	X				X
640	'4400						X
650	'4600	X					X
660	'4800		X	X			X
670	'4A00	X	X	X			X
680	'4C00			X			X
690	'4E00	X		X			X
700	'5000		X		X		X
710	'5200	X	X		X		X
720	'5400				X		X
730	'5600	X			X		X
740	'5800		X	X	X		X
750	'5A00	X	X	X	X		X
760	'5C00			X	X		X
770	'5E00	X		X	X		X



ANIMATOR

Using the Dragon's SAM chip Derek Gladding produces computer animation.

THE SAM IN THE Dragon orchestrates the running of the computer. By Poking into the Sam, various effects can be caused outside of the normal design concept of the machine.

The locations 65478 through to 65491 control the video display and by manipulation can extend the usefulness of the Dragon computer by making available more than the one single text page already provided.

The locations in question are paired so that for example 65479, when Poked with any number, switches on while to switch off Poke 65478. This applies to all the locations but, since the screen display for the Dragon starts at address hex 0400, address 65481 is already set. The effect of cancelling the address by Poking 65480 has the effect of setting the screen start address to 0.

Try this one line program:

10 POKE 65480,0: GOTO 10

You will now see the first 512 locations of the computer displayed on your screen. The other interesting aspect is that these locations are shown in real time ie, while the computer is still running and therefore any update of these locations is displayed before your eyes. You might like to press the keys to see the effect.

Now try this short program:

10 POKE 65480,C: POKE 65479,0: SKIPF

If you insert one of your Basic game tapes into your cassette and run this program you will observe the incoming program entering the cassette buffer. To show the use to which this facility can be used I have included two programs. The first is a monitor of the full Dragon memory which is controlled by the + and − keys to increase or decrease through the memory.

Appended to this program is a list of screen start addresses and the revelent addresses to be Poked. These locations can be used in one line

(continued on page 129)

Listing 1.

```
10 PCLEAR8:CLEAR200,32600
20 DATA"1",0,"2",1,"3",2,"4",3,"Q",4,"W",5,"E",6,"R",7
,"A",8,"S",9,"D",10,"F",11,"Z",12,"X",13,"C",14,"V",15
30 CLS0
40 GOSUB950
50 EXEC32745
60 PRINT@448,"INSTRUCTIONS (Y/N)"
70 A$=INKEY$
80 IFA$="Y" THEN GOSUB1450 :GOTO100:ELSEIFA$="N"THEN10
0
90 GOTO70
100 CLS0
110 OP=&H0600:CO=128:CU=1
120 POKE&H302,&H06:POKE&H303,0:EXEC32630
130 PO=OP
140 BA=PEEK(PO)
150 POKEPO,CU
160 FORT=1 TO 50:NEXTT
170 POKEPO,BA
180 FORT=1 TO 30:NEXTT
190 CLS0
200 A$=INKEY$:IFA$="" THEN150
210 IFA$=CHR$(94) THENPO=PO-32
220 IFA$=CHR$(95) THENPO=PO-128
230 IFA$=CHR$(10) THENPO=PO+32
240 IFA$=CHR$(91) THENPO=PO+128
250 IFA$=CHR$(9) THENPO=PO+1
260 IFA$=CHR$(93) THENPO=PO+4
270 IFA$=CHR$(8) THENPO=PO-1
280 IFA$=CHR$(21) THENPO=PO-4
290 IFPO<OP THENPO=OP
300 IFPO>OP+&H1FF THENPO=OP+&H1FF
310 IFA$="M" GOSUB1760
320 IFA$="I" GOSUB1450:GOSUB1090
330 IFA$=CHR$(75) GOSUB1290
340 IFA$<>CHR$(12) THEN480
350 PRINT@448,"COLOUR NO. OR r TO RETURN"
360 C$=INKEY$:IFC$="" THEN360
370 IFC$="R" THEN GOSUB1080:GOTO470
380 IFC$=<"8" THEN390 ELSE360
390 CL=VAL(C$):IFCL=0 THENCL=128:GOTO410
400 CL=CL*16+127
410 POKE32601,CL
420 B$=HEX$(OP)
430 IFLEN(B$)<4 THENB$="0"+B$
440 B=VAL("&H"+LEFT$(B$,2))
450 POKE32603,B:POKE32608,B+2
460 EXEC32600
470 GOSUB1080
480 IFA$=" " GOSUB1100:GOSUB1080
490 IFA$<>"+" THEN510 ELSE OP=OP+&H200:IFOP=&H3600 THE
NOP=&H600:POKE&H302,&H34
500 CU=CU+1+(CU=24)*24:GOTO520
510 IFA$<>"-" THEN570 ELSEOP=OP-&H200:CU=CU-1+(CU=1)*-
24:IFOP=&H400 THENOP=&H3400:POKE&H302,&H06
520 B$=HEX$(OP)
530 IFLEN(B$)<4 THENB$="0"+B$
540 B=VAL("&H"+LEFT$(B$,2))
550 POKE&H302,B
560 GOSUB1080:GOTO130
570 IFA$<>"F" THEN660
580 OP=&H600:POKE&H302,&H06:PRINT@448,"PRESS LAST PAGE
 LETTER"
590 TW$=INKEY$:IFTW$="" THEN590 ELSETW=ASC(TW$)-64
600 IFTW<1 ORTW>24 THEN590
610 PRINT@448,"SELECT SPEED (1 TO 9)"
620 SP=VAL(INKEY$):IFSP<1 OR SP>9 THEN620
630 CLS0
640 FORDE=1 TO SP*40:NEXTDE:GOSUB1080:OP=OP+&H200:POKE
&H302,PEEK(&H302)+2:IF OP=&H600+(&H200*TW) THEN650 ELS
E640
650 FORDE=1 TO 2000:NEXT:GOTO110
660 IFASC(A$)>32 ANDASC(A$)<41 THEN CO=(ASC(A$)-32)*16
+112
670 FORT=1 TO 16
680 READI$,Z:IFZ$=A$ THENPOKEPO,CO+Z:PO=PO+1:GOTO690:E
LSENEXT
690 RESTORE
700 IFA$=CHR$(63) GOSUB810
710 IFA$<>"*" THEN800 ELSEST=&H600:TW=&H400:L=1
720 FORT=0 TO 31:POKETW+T,PEEK(ST+T):NEXT
730 PRINT@96,"DATA--LINE NO.";L
740 FORT=0 TO 31:PRINTPEEK(ST+T);:NEXT
```

(listing 1 continued on page 129)

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DEF KEY user definable keys
DELETE a block of lines
DO-LOOP structure
DPOKE double poke
EDIT specified line
ELSE (used with IF ... THEN)
EXIT leave DO-LOOP
FILL enclosed area with specified ink or paper
GET wait for keypress
JOIN two program lines
KEYIN a string
KEYWORDS new keywords on/off
LIST/LLIST line TO line
USED (used with GOTO, GOSUB)
ON ERROR trap errors (with LINE, STAT and ERROR)
PLOT a string (may contain cursor control codes)
POKE a string
POP Basic's stack
PROC, DEF PROC, END PROC (for named procedures)
RENUM versatile renumber
ROLL all or part of screen in any direction by specified number of pixels, with or without attributes
SCROLL like ROLL, but without wrap-round
SORT arrays (very fast)
SPLIT program lines
TRACE program execution
UNTIL used with DO or LOOP
USING used with PRINT
WHILE used with DO or LOOP
XOS, YOS move PLOT origin
XRG, YRG change PLOT scale

FUNCTIONS

AND (bit-by-bit)
BIN$ decimal to binary
CHAR$ number to 2 characters
COSE fast cosine
DEC hexadecimal to decimal
DPEEK double PEEK
FILLED filled area
HEX$ decimal to hexadecimal
INSTRING string search
MEM free memory
MEMORY$ all of memory as a string
MOD modulus
NUMBER 2 characters to number
OR (bit-by-bit)
RNDM fast RND
SCRN$ recognises user graphics
SINE fast sine
STRING$ repeats strings
TIME$ current time
USING$ formats numbers
XOR (bit-by-bit)

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(continued from page 127)

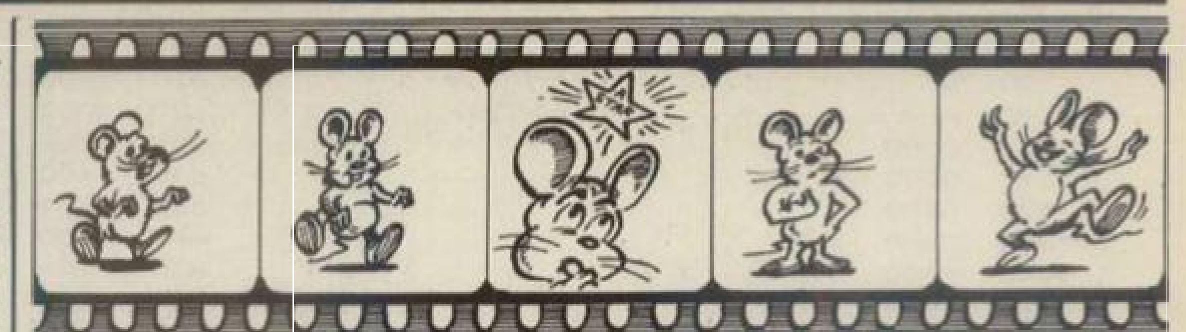
programs as the previous examples show, but if used within a program they would have to be reset to return to the text screen.

The simple way to reset any of the addresses is to insert the command Print. The second program uses the same routine to switch pages but converted to machine code in order to prevent screen flashing when the screen addresses are incremented in quick succession.

The Dragon graphics pages have been used to provide 24 text pages. The program contains many commands which are listed for reference at any time during operation. With these 24 pages available you now have the means to store information such as spreadsheet type data and, as suggested with the program title, cartoon animation.

In brief the facilities provided with the program are as follows:

- Direct entry to the screen of any of the Dragon graphic characters by selected keys, as detailed in the instructions.
- Graphic colours can be changed at any time using Shift and the appropriate colour number.
- By pressing the Dragon abbreviated print symbol ? you enter the text mode which gives you a choice of normal or reverse field writing on all characters.



- The screen can be cleared to any colour using the clear key followed by the colour number.
- Elaborate introductory program pages can be designed and saved from within the program as a machine-code file.
- Pages of graphics can be copied to any other page so that complicated pictures do not have to be redrawn when working on animations.
- Any size of graphics block can be marked and repositioned on the screen.
- Each page has its own cursor code letter.
- The cursor can be moved anywhere on the screen using the arrow keys. If greater cursor movement is required using the shift key will move the cursor four squares at a time in the appropriate direction.
- Any animations can be saved to tape
- If you require to draw out small sections of graphics, such as large letter titles, then you can select the graphic data for any line down of the first page.
- To see your pictures come to life, by pressing P, you can play them on your screen
- As in the monitor program, by pressing the + or − keys you may flick through the pages to view your work.

In order to make use of your title pages, save the screen picture to tape immediately prior to your program for which it was designed. To load your program into the computer from tape you will need a Basic line:

10 CLOADM : CLOAD.

When you run this line your title page will be displayed on the screen while the rest of the program is loading.

(listing 1 continued from page 127)

```
750 PRINT:PRINT:PRINT"PRESS '+' FOR NEXT LINE OR r TO
RETURN"
760 E$=INKEY$:IFE$="" THEN760
770 IFE$="R" THEN800
780 IFE$<>"+" THEN760
790 L=L+1:ST=ST+32:IFST<>&H800 THEN 720
800 GOSUB1080:GOTO140
810 PRINT@448,STRING$(32,143);
820 PRINT@448,;
830 LINEINPUT"MESSAGE:-";M$
840 PRINT@448,"NORMAL/REVERSE FIELD (N/R)";:INPUTTY$
850 GOSUB1080
860 IFTY$="N" THENTY=64:GOTO870 ELSEIFTY$="R" THENTY=6
3 ELSE840
870 FORT=1 TO LEN(M$)
880 IFTY=64 THEN900
890 POKEPO,ASC(MID$(M$,T,1))ANDTY:GOTO910
900 POKEPO,ASC(MID$(M$,T,1))ORTY
910 PO=PO+1
920 NEXT
930 TY=0
940 RETURN
950 DATA&H8000,65491,&H4000,65489,&H2000,65487,&H1000,
65485,&H800,65483,&H200,65479
960 READZ$,Z:IFZ=15 THEN970 ELSE960
970 FORT=1 TO 6:READA(T),B(T):NEXT
980 DATA86,8F,8E,04,00,A7,80,8C,06,00,26,F9,39,8E,06,0
0,10,8E,04,00,A6,80,A7,A0,8C,08,00,26,F7,39
990 DATA7F,FF,D2,7F,FF,D0,7F,FF,CE,7F,FF,CC,7F,FF,CA,7
F,FF,C9,7F,FF,C6,FC,03,02,10,83,80,00,25,06,83
1000 DATA80,00,7F,FF,D3,10,83,40,00,25,06,83,40,00,7F,
FF,D1,10,83,20,00,25,06,83,20,00,7F,FF,CF,10,83,10,00,
25,06,83,10,00,7F,FF,CD,10
1010 DATA83,08,00,25,06,83,08,00,7F,FF,CB,10,83,04,00,
26,03,7F,FF,C7,10,83,02,00,26,06,7F,FF,C7,7F,FF,C8,10,
83,00,00,26,03,7F,FF,C8,39
1020 DATA8E,80,80,10,8E,06,00,AF,A1,10,8C,36,00,26,F8,
39,END
1030 M=32600
1040 READA$:IFA$="END" THEN1060 ELSEPOKEM,VAL("&H"+A$)
1050 M=M+1:GOTO1040
1060 RESTORE
1070 RETURN
1080 EXEC32630
1090 RETURN
1100 PRINT@352,"PRESS:-      T SAVE TITLE EAGE
      A SAVE ANIMATIONS                   L LOAD PICTURES
                  R RETURN"
1110 E$=INKEY$
1120 IFE$="T" THEN1130 ELSEIFE$="A" THEN1190 ELSEIFE$=
"L" THEN CLOADM:RETURN: ELSEIFE$="R' THENRETURN ELSE11
10
1130 PRINT@448,"SELECT RECORD & PRESS ENTER"
1140 IFINKEY$<>CHR$(13) THEN1140
1150 POKE32614,&H06:POKE32625,&H08:POKE32618,&H04
1160 EXEC32613
1170 CSAVEM"INTRO",&H400,&H5FF,&H400
1180 RETURN
1190 PRINT@448,"PRESS LAST PAGE LETTER"
1200 TW$=INKEY$:IFTW$="" THEN1200 ELSETW=ASC(TW$)-64
1210 IFTW<1 ORTW>24 THEN1200
1220 PRINT@448,"SELECT RECORD & PRESS ENTER"
1230 IFINKEY$<>CHR$(13) THEN1220
1240 CSAVEM"ANIMATE ",&H600,TW*&H200+&H600,&H600
1250 RETURN
1260 A$=INKEY$:IFA$="" THEN1260
1270 PRINT@0,ASC(A$)
1280 GOTO1260
```

(listing 1 continued on next page)

Monitor listing

```
10 CLS
20 DATA&H8000,65491,&H4000,65489,&H2000,
65487,&H1000,6
5485,&H800,65483,&H200,65479
30 GOSUB110
40 FORT=1 TO 6:READA(T),B(T):NEXT
50 A$=INKEY$
60 IFA$="+" THENOP=OP+&H200:GOSUB90
70 IFA$="-" THENOP=OP-&H200:GOSUB90
80 GOTO50
90 IFOP<0 THENOP=&HFE00
100 IFOP>&HFE00 THENOP=0
110 PRINT@0,"NEXT PAGE STARTS AT &H"HEX$(OP)
120 FORD=1 TO 500:NEXT
130 NP=OP:FORT=1 TO 5:IFNP<A(T)
THEN NEXT ELSENP=NP-A(
T):POKEB(T),0:NEXT
140 IFNP=&H600 THENPOKE65479,0
150 IFNP=&H200 THENPOKE65479,0:POKE65480,0
160 IFNP=0 THENPOKE65480,0
170 RETURN
180 '
190 '
200 'arrangement of pokes for
                selected screen addresses
210 '
220 '
230 'S
240 'C P   6   6   6   6   6   6
250 'R A   5   5   5   5   5   5
260 'E G   4   4   4   4   4   4
270 'E E   7   8   8   8   8   8
```

(Monitor listing continued on next page)

(Monitor listing continued from previous page)

```
280 'N      9   0   3   5   7   9
290 '------------------------------
300 '0000       X
310 '0200   X   X
320 '0400
330 '0600   X
340 '0800       X   X
350 '0A00   X   X   X
360 '0C00           X
370 '0E00   X       X
380 '1000       X       X
390 '1200   X   X       X
400 '1400               X
410 '1600   X           X
420 '1800       X   X   X
430 '1A00   X   X   X   X
440 '1C00           X   X
450 '1E00   X       X   X
460 '2000       X           X
470 '2200   X   X           X
480 '2400                   X
490 '2600   X               X
500 '2800       X   X       X
510 '2A00   X   X   X       X
520 '2C00           X       X
530 '2E00   X       X       X
540 '3000       X       X   X
550 '3200   X   X       X   X
560 '3400               X   X
570 '3600   X           X   X
580 '3800       X   X   X   X
590 '3A00   X   X   X   X   X
600 '3C00           X   X   X
610 '3E00   X       X   X   X
620 '4000       X               X
630 '4200   X   X               X
640 '4400                       X
650 '4600   X                   X
660 '4800       X   X           X
670 '4A00   X   X   X           X
680 '4C00           X           X
690 '4E00   X       X           X
700 '5000       X       X       X
710 '5200   X   X       X       X
720 '5400               X       X
730 '5600   X           X       X
740 '5800       X   X   X       X
750 '5A00   X   X   X   X       X
760 '5C00           X   X       X
770 '5E00   X       X   X       X
780 '6000       X           X   X
790 '6200   X   X           X   X
800 '6400                   X   X
810 '6600   X               X   X
820 '6800       X   X       X   X
830 '6A00   X   X   X       X   X
840 '6C00           X       X   X
850 '6E00   X       X       X   X
860 '7000       X       X   X   X
870 '7200   X   X       X   X   X
880 '7400               X   X   X
890 '7600   X           X   X   X
900 '7800       X   X   X   X   X
910 '7A00   X   X   X   X   X   X
920 '7C00           X   X   X   X
```

(listing 1 continued from previous page)

```
1290 PRINT@448,;:INPUT"FROM PAGE ";ST$
1300 ST=ASC(ST$)-64
1310 IFST<1 ORST>24 THEN1290
1320 PRINT@448,;:INPUT"  TO PAGE ";TW$
1330 TW=ASC(TW$)-64
1340 IFTW<1 ORTW>24 THEN1320
1350 ST$=HEX$((ST*&H200)+&H400)
1360 TW$=HEX$((TW*&H200)+&H400)
1370 IFLEN(ST$)<4 THENST$="0"+ST$
1380 IFLEN(TW$)<4 THENTW$="0"+TW$
1390 ST=VAL("&H"+LEFT$(ST$,2))
1400 TW=VAL("&H"+LEFT$(TW$,2))
1410 POKE32614,ST:POKE32625,ST+2:POKE32618,TW
1420 EXEC32613
1430 GOSUB1080
1440 RETURN
1450 CLS0
1460 PRINT@0,"'s' = SHIFT";
1470 PRINT@14
1480 PRINT@64,"    ARROWS-----------MOVE CURSOR
1490 PRINT@128,"'s'+ARROWS--------EXTRA MOVEMENT"
1500 PRINT@192,"'CLEAR'------------CLEAR SCREEN"
1510 PRINT@256,"'K'----------------TO COPY PAGES"
1520 PRINT@320,"'?'---------------ENTER WRITTING
1530 PRINT@384,"'SPACE'----LOAD OR SAVE SCREENS"
1540 PRINT@448,"'s'+ NO.-------CHANGE COLOUR SET
1550 GOSUB1720
1560 CLS0
1570 PRINT@14
1580 PRINT@64,"'I'-------------FOR INSTRUCTIONS";
1590 PRINT@128,"'P'---------------DISPLAY FILM
1600 PRINT@192,"'+'OR'-'------TO TURN THE PAGES
1610 PRINT@256,"'*'---------TO PRINT LINE DATA
     FROM FIRST PAGE ONLY";
1620 PRINT@352,"M-------------TO MOVE BLOCKS OF GRAPHI
CS,POSITION THE CURSOR AT THE TOP LEFT & THEN BOTTOM R
IGHTOF THE BLOCK & PRESS 'm' IN EACHPOSITION.";
1630 GOSUB1720
1640 CLS0:PRINT@14
1650 PRINT@64,"TO ENTER GRAPHICS USE THE BLOCK OF 16 K
EYS:- '1' TO '4' ACROSS  '1' TO 'Z' DOWN IN THE ORDER
AS SHOWN IN THE GRAPHIC CHARACTER SECTION OF THE DRAGO
N MANUAL."
1660 PRINT@260,"1";CHR$(128)CHR$(128);:PRINT@267,"2"CH
R$(128);CHR$(177);:PRINT@274,"3"CHR$(128)CHR$(178);:PR
INT@281,"4"CHR$(128)CHR$(179);
1670 PRINT@324,"Q"CHR$(128)CHR$(180);:PRINT@331,"W"CHR
$(128)CHR$(181);:PRINT@338,"E"CHR$(128)CHR$(182);:PRIN
T@345,"R"CHR$(128)CHR$(183);
1680 PRINT@388,"A"CHR$(128)CHR$(184);:PRINT@395,"S"CHR
$(128)CHR$(185);:PRINT@402,"D"CHR$(128)CHR$(186);:PRIN
T@409,"F"CHR$(128)CHR$(187);
1690 PRINT@452,"Z"CHR$(128)CHR$(188);:PRINT@459,"X"CHR
$(128)CHR$(189);:PRINT@466,"C"CHR$(128)CHR$(190);:PRIN
T@473,"V"CHR$(128)CHR$(191);
1700 GOSUB1720
1710 RETURN
1720 PRINT@14,;:INPUT"PRESS 'ENTER'";E$:IFE$="" THEN R
ETURN ELSE1720
1730 GOSUB1080
1740 CLS0
1750 RETURN
1760 MO=MO+1
1770 IFMO=1 THENBL=BA:PL=PO:POKEPO,35:RETURN
1780 BR=BA:PR=PO:MO=0:POKEPO,35
1790 POKEPL,BL:POKEPR,BR
1800 IFPR<PL THEN MO=0:RETURN
1810 PRINT@448," r -RETURN OR ARROWS TO MOVE"
1820 E$=INKEY$:IFE$="" THEN1820 ELSEEXEC32630
1830 Y=FIX((PR-PL)/32)
1840 X=PR-(PL+(Y*32))
1850 IFE$="R" THENRETURN
1860 IFE$=CHR$(9) GOSUB1880 ELSEIFE$=CHR$(8) GOSUB1940
 ELSE IFE$=CHR$(94) GOSUB2000 ELSEIFE$=CHR$(10) GOSUB2
060 ELSE1820
1870 GOTO1820
1880 FORHO=X TO 0 STEP-1
1890 FORVE=Y*32 TO 0 STEP-32
1900 POKEPL+HO+1+VE,PEEK(PL+HO+VE)
1910 NEXTVE,HO
1920 PL=PL+1:PR=PR+1
1930 RETURN
1940 FORHO=0 TO X
1950 FORVE=Y*32 TO 0 STEP-32
1960 POKEPL+HO-1+VE,PEEK(PL+HO+VE)
1970 NEXTVE,HO
1980 PL=PL-1:PR=PR-1
1990 RETURN
2000 FORVE=0 TO Y*32 STEP32
2010 FORHO=0 TO X
2020 POKEPL-32+VE+HO,PEEK(PL+VE+HO)
2030 NEXTHO,VE
2040 PL=PL-32:PR=PR-32
2050 RETURN
2060 FORVE=Y*32 TO 0 STEP-32
2070 FORHO=0 TO X
2080 POKEPL+32+VE+HO,PEEK(PL+VE+HO)
2090 NEXTHO,VE
2100 PL=PL+32:PR=PR+32
2110 RETURN
```

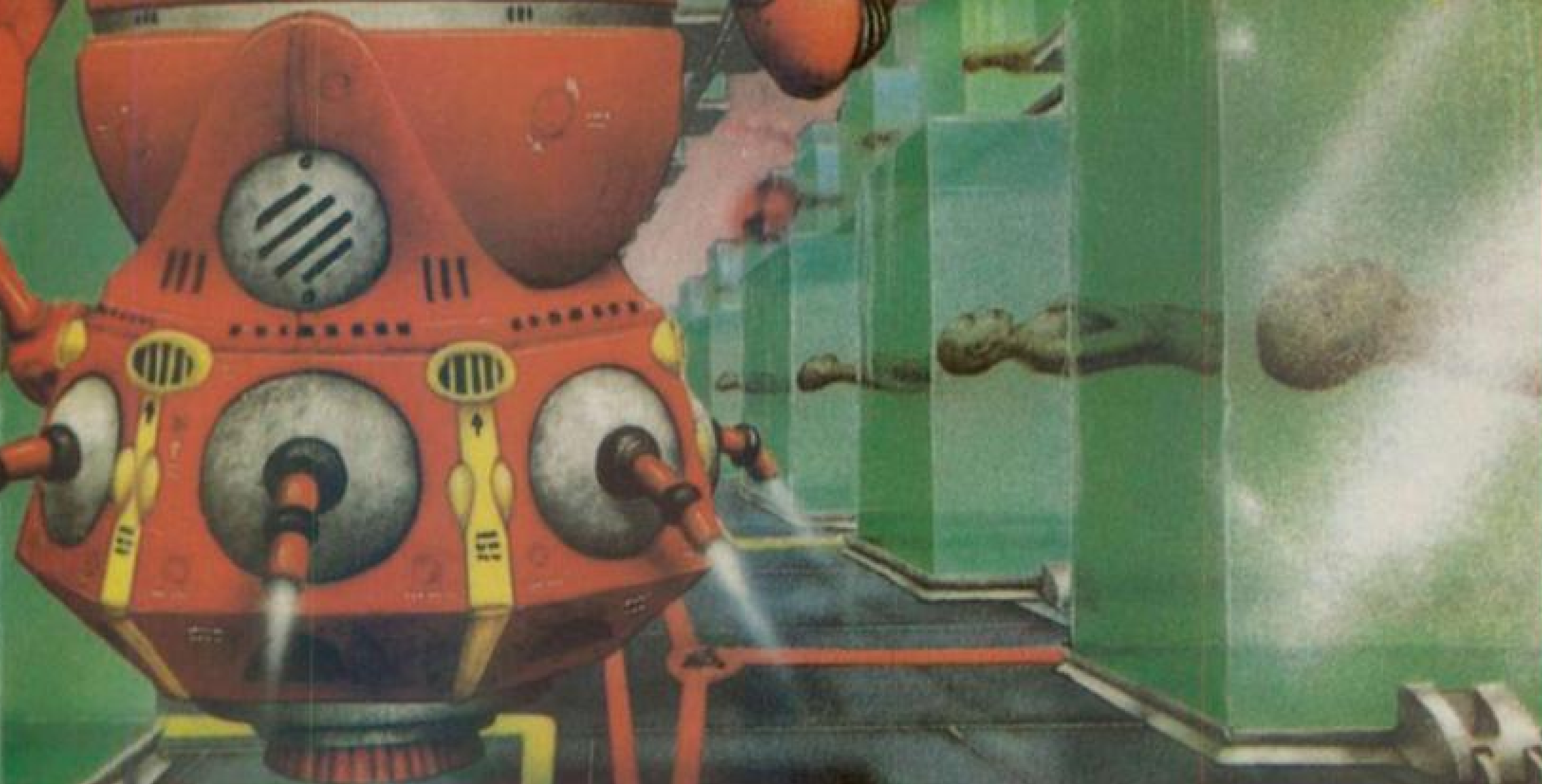
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SPECTRUM DRAW

Program 1.

```
  10 POKE 23693,7: POKE 23694,0:
 POKE 23697,0: BORDER 0: CLEAR 2
9999: LOAD ""CODE : CLS
  20 POKE 32583,1: POKE 32582,1:
 POKE 23681,0: POKE 32578,128: P
OKE 32579,88
  30 RANDOMIZE USR 30017
  40 GO SUB USR 31967: GO TO 40
1000 INPUT "Name ? "; LINE a$: I
F NOT LEN a$ OR LEN a$>10 THEN G
O TO 1000
1010 SAVE a$ SCREEN$ : RANDOMIZE
 USR 30017: RETURN
1100 INPUT "Name ? "; LINE a$: L
OAD a$ SCREEN$ : RANDOMIZE USR 3
0017: RETURN
1200 RANDOMIZE USR 30017: INPUT
AT 0,0; PAPER 6; INK 0;"Text (ma
x. ";INT ((256-PEEK 32578)/8/PEE
K 23728);")",, LINE a$: PRINT ;:
 RANDOMIZE USR 31176: REM a$
1210 RANDOMIZE USR 30017: RETURN

3000 LET f=0: GO TO 3020
3010 LET f=1
3020 LET cx=PEEK 32578: LET cy=P
EEK 32579: LET lx=PEEK 32580: LE
T ly=PEEK 32581: LET r=SQR ((cx-
lx)*(cx-lx)+(cy-ly)*(cy-ly))
3030 IF f THEN LET cx=lx: LET cy
=ly
3050 LET lx=cx+r: LET ly=cy: POK
E 32584,lx-256*INT (lx/255): POK
E 32585,128+INT (lx/255): POKE 3
2586,ly: POKE 32587,128
3060 LET s=2*INT (INT (PI*SQR r+
.5)/2)+2: IF s>252 THEN LET s=25
2
3070 FOR n=0 TO 2*PI STEP PI/s
3080 LET x=INT (.5+cx+r*COS n)
3090 LET y=INT (.5+cy+r*SIN n)
3100 RANDOMIZE USR 31526: REM x-
lx,y-ly
3110 LET ly=y: LET lx=x: NEXT n
3120 RANDOMIZE USR 31526: REM cx
+r-lx,cy-ly
3130 RANDOMIZE USR 30017: RETURN
```

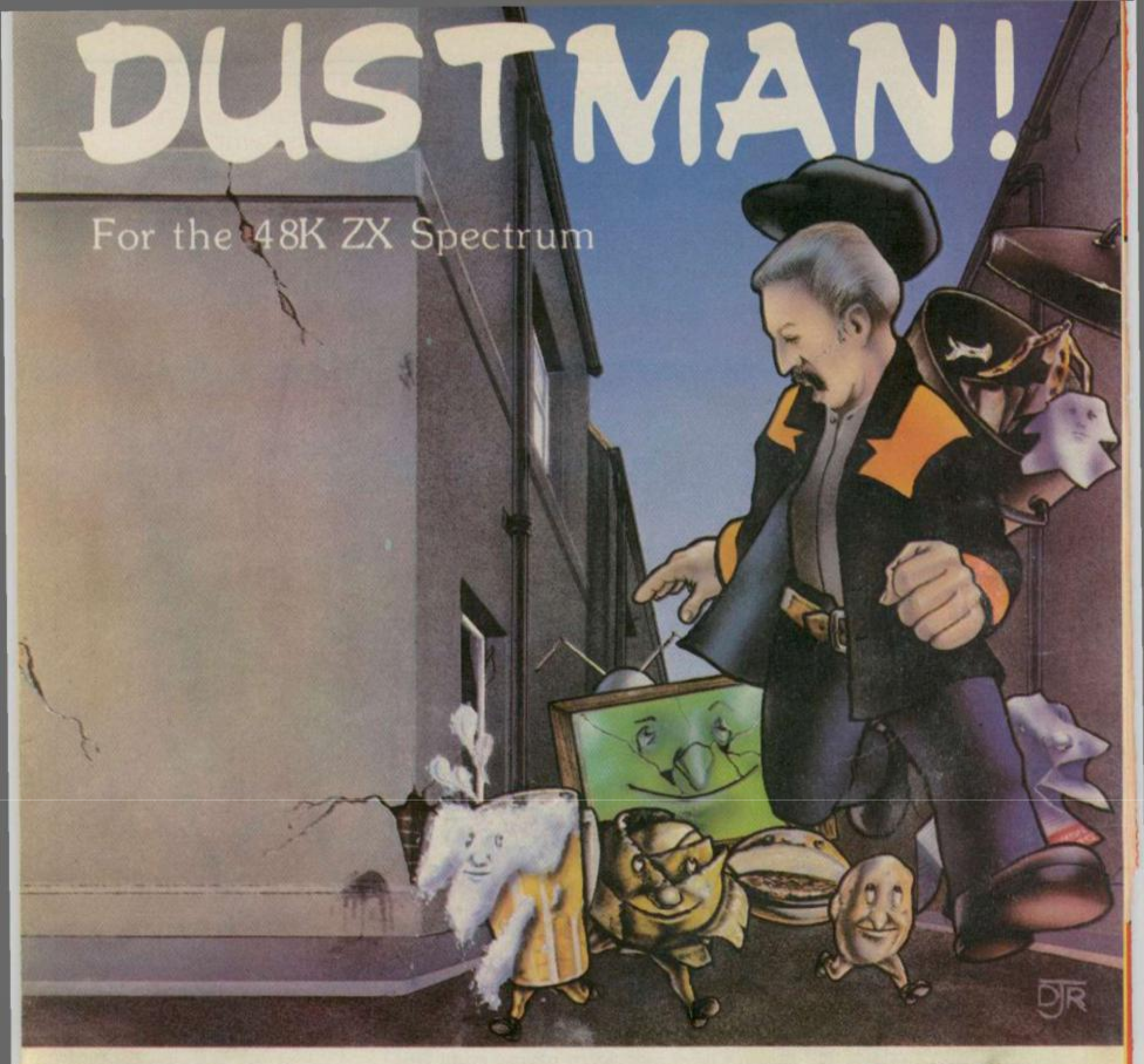
THIS GRAPHICS program for any ZX Spectrum contains the following facilities: Full control of colours, Flash, Bright, Over and Inverse; Draw lines, boxes and circles using normal or dotted lines and with a choice of nine different line widths. Circles may be partly off screen; fill areas; text in nine widths and nine heights; rubber band facility; reference points; Save/Load screens; variable cursor speed; Copy to printer; CLS.

The two bottom lines of the screen give you information on the cursor co-ordinates and the current Ink, Paper, Flash, Bright, Over, Inverse and Dot parameters.

Table 1 lists the keys used and explains how to use them. The program consists of 2050

(continued on page 135)





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YC6

Table 1.	
5,6,7,8	Cursor keys. Press Caps Shift for greater steps.
0	Plots a dot at the cursor position.
k,l	Make the cursor move faster/slower.
x	Sets Ink colour.
c	Sets Paper colour.
v	Sets Flash parameter.
b	Sets Bright parameter.
n	Changes Over state.
m	Changes Inverse state.
d	Changes Dot state.
z	Copy.
V	CLS. The program will ask "CLS?". Press Y to clear the screen.
s	Save screen to tape.
j	Load screen from tape.
f	Fill.
r	Controls the rubber bands. To switch band no. 2, for example, on/off, press r and then 2.
y	Reference 1. To set the reference point, move the cursor to the desired location and press y. Now, if you press y, the cursor will jump to this point.
u	Reference 2.
p	Sets the brush size (= line width).
t	Print text string at current cursor position. The program will ask for horizontal and vertical size. Note that different brush sizes produce different fonts.
q	This key is used to set the first point when drawing lines, circles and boxes. The second point is set using the corresponding key. To draw a line, for instance, you move the cursor to one end point, press q, then to the other end point and press w.
w	Lines.
i	Boxes. Two diagonally opposite points are needed.
g,h	Both these keys are used to draw circles, and the points needed are the centre and one on the circumference. With g, you set the point on the circumference first, with h, you set the centre first.
o	Sets Border colour.
a	Colour change. This makes the colours the screen colours.

(continued from page 133)

bytes of machine code and a small Basic program which contains routines for loading, saving and circle drawing.

First, type in program 1. Do not run it yet. Save it on tape and type New.

Now enter program 2 and run it. When it has run successfully, type New and enter program 3, which generates the tables used by the program. When it has run, it will save the code.

Rewind the tape, type LOAD "" and try it all out. To turn off the beep, type

POKE 30725,201

To stop the program, press j and then Caps Shift and 6. To make it a click, type

POKE 30727,0

You can extend the range of commands available by amending the Data statements in program 3. If, for instance, you write a Basic routine at line 5000, and want to allocate it to key e, simply insert e5000 at line 3000, and change the 4 at line 3010 to a 5.



Table 2.	
Address	
32578	Co-ordinates of cursor.
32580	Co-ordinates of last point — set with q.
32582	Brush size.
32583	Cursor speed.
32584	Store of co-ordinates. Used by
32586	off-screen line-drawing routine.
32588	Co-ordinates of first and
32590	second reference point.
32592	Co-ordinates of rubber bands.
23681	Bit 0: Dot on.
	Bit 1: Dot flag.
	Bits 2-5: Rubber band flags.

Program 2.

```
  10 CLEAR 29999: LET p=30000: F
OR l=1000 TO 1310 STEP 10
  20 READ d,a$
  30 LET c=0: FOR n=1 TO LEN a$
STEP 2
  40 LET a=CODE a$(n)-48: LET b=
CODE a$(n+1)-48
  50 LET a=a-39*(a>9): LET b=b-3
9*(b>9): POKE p,16*a+b
  60 LET c=c+PEEK p: LET p=p+1
  70 NEXT n: PRINT l;" ";: IF c<
>d THEN PRINT "error": STOP
  80 PRINT "OK": NEXT l
1000 DATA 6929,"ed437d5ccdaa2247
043e010f10fdae77c9ed4b427f79d60a
3801afc6145f79c60a4f30057b915f0e
ffc5cd3075c10d1d20f7ed4b427f78d6
0a3801afc6145f78"
1010 DATA 6672,"c60a473eaf903004
835f06afcdaa2247043e010f10fd434f
7ea977cd687610f806043a815c1f1f21
507fc5e51ff5dca975f1e1c1232310f2
c95e23562a427f22"
1020 DATA 6352,"7d5c7a940e013004
7c920eff47517b950e0130047d930eff
594fb8300669d5af5f1807b1c86841d5
160060781f853803bc3807944fd9c1c5
18044fd5d9c12a7d"
1030 DATA 7199,"5c78844779854fcd
3075d97910dfd1215827d9c9ed437d5c
3a467ffe02301121815c7ecb472806ee
0277e602c8c3e5225f6fcb3f57799230
03835faf4f789230"
1040 DATA 6776,"03856faf47556369
fdcb5786e5c5d5cd0f76d1c10c28031d
20f3e14d5c0478feb030031520e62191
5ccb4ec8cbc6c9000000000000000000
247ce607c07dc620"
1050 DATA 9208,"6fd07cd60067c9cb
422804a7c83dc9d608d0afc9cb422804
3cc03dc9c608d03effc9ed4b427f3efe
dbfe573ef7dbfecb6779cc77764f3eef
dbfe5fcb6378cc77"
1060 DATA 8329,"7647cb5b78cc8476
feb038023eaf47cb5379cc84764f2a42
7f3ebfdbfe5f3a477fcb4bcc8476cb53
cc776324 77fa72809c547c510fec110
faclед42c809c5cd"
1070 DATA 7557,"41753eefdbfe1fed
4b427fd40476e122427fcd4175188bc5
cdaa2247043e010f10fda6c1c9c5d501
0500cd051fd1c1c9ed4b427fcd0777c0
c521467f7ef53601"
1080 DATA 7315,"21815c7ef5cb8621
915c7eeb6fa7701fffc5ed4b427fcd07
7720070ced43427f20f01100000ded43
427fc5d5cd0476d1c178feaf28207ba7
200c04cd07772006"
1090 DATA 5289,"cd1577c51e01ed4b
427f7b3d200804cd077728021e00ed4b
427f78a728207aa7200c05cd07772006
cd1577c516017a3d200ced4b427f05cd
077728021600ed4b"
1100 DATA 7417,"427f79a7280a0ded
43427fcd077728 9ae122427f24c24277
2cc24277f132815cf132467fe122427f
c9d5012117cdd90dd1affd365530fd77
56c3227dfdcb016e"
1110 DATA 85[illegible]9,"28fa3a085cfdcb01
aec9cdec77d6[illegible]38f9fe0a30f5f51132
00210001cdb503f1c9cdec77d63138f9
3cfe0a30f418e6cdec77d63038f9fe02
38dbfe0820f118d5"
1120 DATA 6210,"42414e44204e4f2e
2028312d3429203fa0112f78cdd977cd
ec77d63138f9fe0430f5cd0578114e7f
3c473e0207131310fb21815c4fae77a1
c82a427feb732372"
1130 DATA 7136,"c9cd4d0dfdcb57d6
012118cdd90d3e58d73a427fcd627911
4d79cd3f793a8d5ce607ee30fdcb5446
28023e38fdcb576e28023e39d7114e79
cd3f793a8d5c07e6"
1140 DATA 6884,"01ee30fdcb547e28
023e38d7115179cd3f793a915ce6020f
ee30d7115379cd3f793a815ce601ee30
d73e20d73e59d73a437fcd6279115579
cd3f793a8d5c0f0f"
1150 DATA 6554,"0fe607ee30fdcb54
5e28023e38fdcb577e28023e39d71158
79cd3f793a8d5c0707e601ee30fdcb54
7628023e38d7115b79cd3f793a915c0f
0f0fe601ee30d711"
1160 DATA 7767,"5d79cd3f793a467f
ee30d73e20d7c93e20d73e8fd7afcd0a
0c3e20d7c980494ecb46cc4fd6444fd4
5050d242d249ce4253a05f1600d5c32c
1afd5e76fd567761"
1170 DATA 7736,"6be5c5d5cd0476d1
c10c1d20f5e14c5d05783cc81520eac9
1608cb13d5c5dc6979c1d1fd7e7681d8
4f1520eec92a365cfe8038052a7b5cd6
90eb6f2600292929"
1180 DATA 8176,"1916085ee5d5c5cd
8879c1d1e178fd9677d847231520ecc9
dfe5e7e7cdb228ed4b427f235e231c1d
281723d5e5c57ecd9d79c1e1d1fd7e76
070707813803 4f18"
1190 DATA 4526,"e6e1c3780080494e
4b2028302d392920bf5041504552202 8
302d392920bf464c415348202830 2c31
2c382920bf425249474854202830 2c31
```

(Program 2 continued on page 137)

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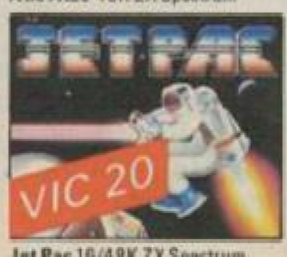
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(Program 2 continued from page 135)

```
2c382920bf120143"
1200 DATA 5213,"4c533fbf424f5244
45522028302d372920bf425255534820
53495a452028312d392939fa011f579cd
d977cdfa7757377a0607380507070706
384f7a218d5cfe08"
1210 DATA 6761,"79380a7e2807b02f
e624280178cd6c223e07ba9fcd6c2223
23070707e6a0c3672211f679cdd977cd
fa7757a718c111017acdd977cd1f780f
5f0680218d5ccd6c"
1220 DATA 6673,"227b0f0f0fc36c22
110e7acdd977cd1f780f0f5f0640218d
5ccd6c227b0f0f0fc36c2221915c7eee
0277c921915c7eee0877c9111d7acdd9
77cdec77cd0578fe"
1230 DATA 8282,"39ca6b0dc921815c
3e01ae77c9112d7acdd977cdec77d630
38f9fe0830f5cd0578c39b2211347acd
d977cd1178324467fc9ed43447fc9dfe5
e7e7cd7a1ccd0723"
1240 DATA 6288,"e1225d5c79b83006
69c5af5f1807b1c86841d51600607818
853803bc3807944fd9c1c518044fd5d9
c12a487f79a72806233d28022b2b2248
7fe52a4a7f78a728"
1250 DATA 5960,"06233d28022b2b22
4a7fd13e80bc200dba200a7dfeb03005
454bcd0476d97910b7f1215827d9c92a
447fed43447f3e8032497f324b7f7d32
487f7c324a7f1601"
1260 DATA 8182,"5a789430047c9016
ff47799530047d911eff4fc3347b2a44
7fe5c544cd977bc1c5cd977bc1e1e5c5
4dcd977bc1c1c3977b21c05011c1503e
10011f0070e5d5ed"
1270 DATA 8222,"b0d1e108cd6876eb
cd6876eb083d20e921c05a11c15a3630
013f00edb0c97e23bbc807d8232318f6
cd7178fdcb309e2a8d5cbfcd5b0da7fd
cb016efdcb01aec8"
1280 DATA 5833,"fd5ece21f47ecd0e
7c283721327dcd0e7c3fd0e5cd0578cd
4175e14e234637c9484f522e2053495a
452028312d392920bf5645522e205349
5a452028312d3929"
1290 DATA 8546,"20bf7bfe742020cd
e17b114f7ccdd977cd117832b05c1150
7ccdd977cd117832b15c01b00437c9fe
30f5e5c40578cd4175e15e2356cb7acb
bad5c4e17be1ed4b"
1300 DATA 6600,"427fcd2c16cd4175
f128063a045c3c20faa7c92a4c7f2242
7fc92a427f224c7fc92a4e7f224274c9
2a427f224e7fc93e01cd0116cd9276cd
4d0dcd187c30f5c9"
1310 DATA 7619,"210058ed5b8d5c01
c0027eaba2abfdcb577e2808e6c7cb57
2002ee38fdcb576e2808e6f8cb6f2002
ee0777230b78b120d9c921915ccb86cb
96cd0a0cafc35e0d"
```

Program 3.

```
3000 DATA "g3000","h3010","j1100
","s1000"
3010 LET p=32050: FOR n=1 TO 4:
READ a$: POKE p,CODE a$: LET a=V
AL a$(2 TO )
3020 POKE p+1,a-256*INT (a/256):
 POKE p+2,INT (a/256): LET p=p+3
: NEXT n: POKE p,128
4000 DATA 4178,"07604 f7720 rf84
1 xfa54 cfa91 vfa9e bfab8 n7ad3
m7adb Vfae3 d7af5 ofafd"
4010 DATA 2890,"z0eac t0000 pfb1
4 q7b21 w7b97 i7bc6 y7cc3 Y7cca
u7cd1 U7cd8 a7cf0 "+CHR$ 128+"00
00"
4050 LET p=32500
4060 FOR n=1 TO 2
5000 READ t,a$: LET c=0
5010 POKE p,CODE a$
5020 POKE p+1,16*(CODE a$(4)-48-
39*(a$(4)>"9"))+CODE a$(5)-48-39
*(a$(5)>"9")
5030 POKE p+2,16*(CODE a$(2)-48-
39*(a$(2)>"9"))+CODE a$(3)-48-39
*(a$(3)>"9")
5040 LET c=c+PEEK (p+1)+PEEK (p+
2): LET p=p+3: LET a$=a$(7 TO ):
 IF LEN a$ THEN GO TO 5010
5050 PRINT 3990+n*10;: IF c<>t T
HEN PRINT " error": STOP
5060 PRINT " OK": NEXT n
6000 SAVE "mc"CODE 30000,2600
```
■

THINGS TO DO WITH YOUR VIC

Andrew Bacon cobbles together a number of useful facilities for you to try out on your Vic-20.

WE ALL KNOW that Commodore produces some of the best computers by far, but also that the documentation which accompanies them falls to a much lower standard. So here are a few bits and pieces gathered together from many different sources which may help you on your way to making the perfect program.

It is split up into four sections as follows:

- Special effects with the Super Expander.
- Some interesting Peek locations.
- Hi-res with a joystick on the unexpanded Vic.
- Bits and pieces.

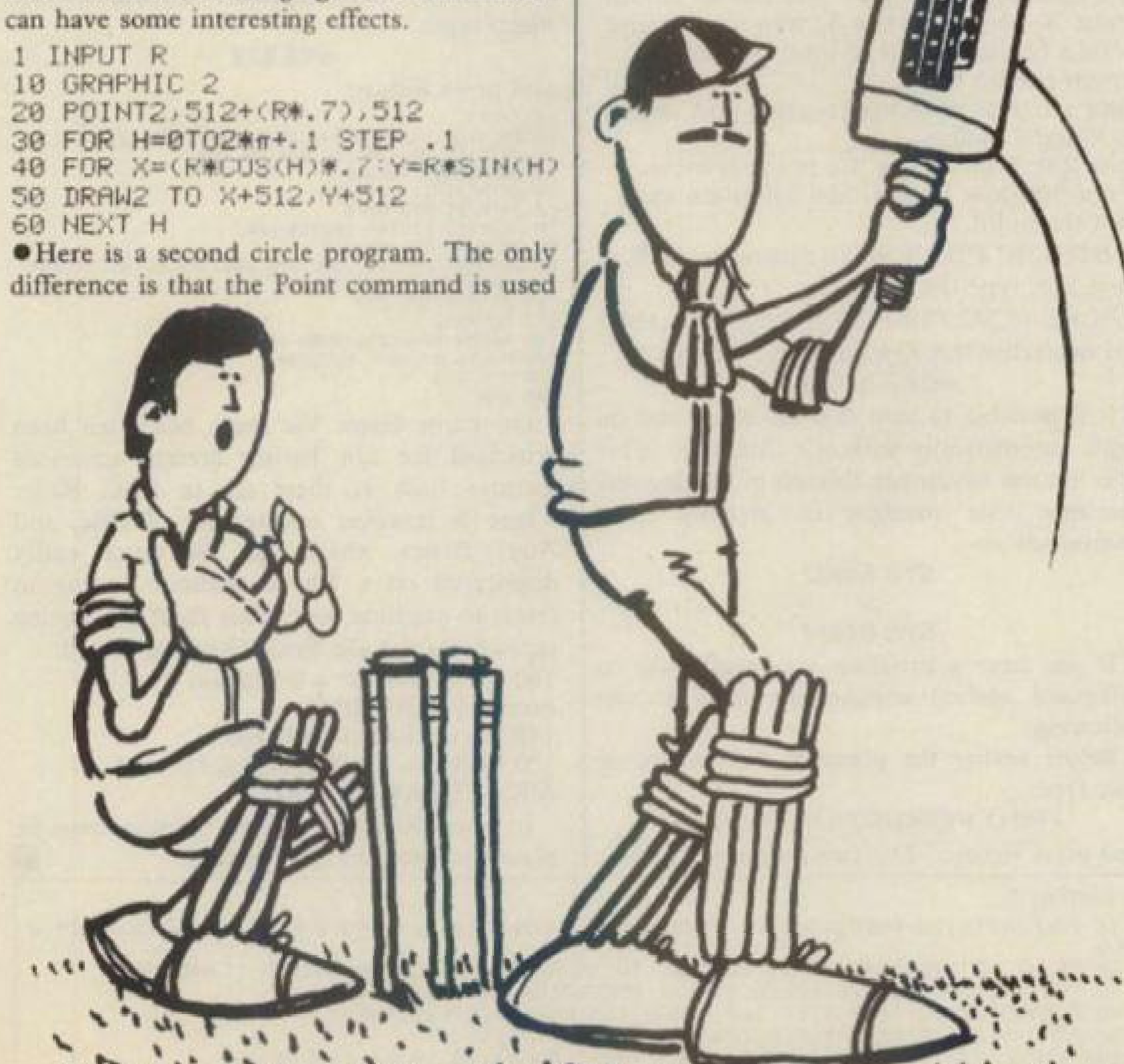
VIC-20 + SUPER EXPANDER SPECIAL EFFECTS: With the Super Expander, one of the extra commands is Circle. When the computer comes across this command with all of its parameters, it draws a circle. But how does it find out and plot the points? This program finds out the next point and joins it to the previous one by using the Draw command. Changing the .1's in line 30 can have some interesting effects.

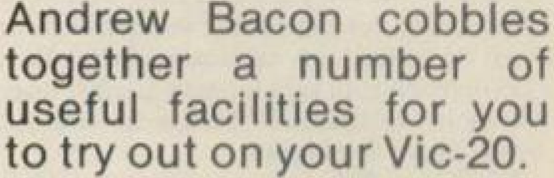
```
1 INPUT R
10 GRAPHIC 2
20 POINT2,512+(R*.7),512
30 FOR H=0TO2*π+.1 STEP .1
40 FOR X=(R*COS(H)*.7:Y=R*SIN(H)
50 DRAW2 TO X+512,Y+512
60 NEXT H
```

● Here is a second circle program. The only difference is that the Point command is used instead of Draw, and line 30 is slightly changed.

```
1 INPUT R
10 GRAPHIC 2
30 FOR H=0TO2*π+.1 STEP .03
40 FOR X=(R*COS(H)*.7 Y=R*SIN(H)
50 POINT2,X+512,Y+512
60 NEXT H
70 END
```

● The program right, short though it may be, can draw some very good 3-D pictures. Changing the Sin in line 30, to a Cos will turn the drawing upside down. Changing the value of 100 in line 30 will change the steepness of the hills.





```
10 GRAPHIC2:COLOR2,2,1,5
20 FOR A=0 TO 470 STEP 15
30 B=SIN((A)/50)*100
40 CIRCLE2,512,B+500,A,A
50 NEXT
60 END
```

● Do you know about Graphic 4? You don't? Well then I'll tell you about it. After turning the Vic-20 on, you are told that you have 6519 bytes free. But once you've typed a Super Expander command you only have 3069 bytes free left. Where have they all gone to?

This is one of the failings of the Super Expander, but to solve it, type

GRAPHIC 4

and press Return. Then type

PRINT FRE(O)

and press Return. You should now have all your memory back.

Never type Graphic 4 before Graphic 1, 2 or 3 have been used. If you do, the computer will crash and any program in memory will be lost.

● Anyone with a Super Expander will of course know how to plot pixels by using the extra commands. Not everyone though knows how to unplot them. I have therefore written a short program to show this, which is under the explanation of how to unplot pixels.

To draw a circle you may type:

CIRCLE 2,512,512,320,460

Then to unplot it you would type:

CIRCLEOVER 2,512,512,320,460

It is not really important what the word or character is after the command Circle, as long as it it not another system command, ie:

CIRCLETAB 2,512,512,320,460

is incorrect.

CIRCLE X2,512,512,320,460

is correct.

You can also unplot with Draw and Point.

DRAW 2,0,0 to 1023,1023

draws a diagonal line.

DRAW Z2,0,0 to 1023,1023

will unplot it.

POINT 2,512,512

plots a point in the middle of the screen.

POINT F2,512,512

will unplot that point.

(continued on next page)

(continued from previous page)

```
10 COLOR2,6,5,6
20 GRAPHIC2
30 CIRCLE2,565,465,345,460
40 DRAW 2,360,100 TO 765,100 TO 765,610 TO 360,
   610 TO 360,100
50 REGION5:PAINT2,430,210
60 FOR Q=200 TO 0 STEP -6
70 CIRCLEX2,560,360,Q*.7,Q:NEXT Q
80 CIRCLE2,560,360,50,40
90 REGION7:PAINT2,560,360
100 REGION3:PAINT2,565,800:PAINT2,565,70:REGION6
110 DRAW2,200,0 TO 200,930 TO 930,930 TO 930,0
120 PAINT2,0,0
130 COLOR2,6,2,2:FOR T=0 TO 200:NEXT:COLOR1,6,
    1,1:FOR T=0 TO 200:NEXT:GOTO 130
```

PEEK LOCATIONS: The following Peek locations may be of some help towards solving your problems. It is not possible to change the contents of these locations because they are checked by the computer every few tenths of a second. The contents of the locations can be read by using the command Print Peek (location). Next to each location number there will be an explanation of the number returned by the above command.

PEEK(17): This location returns a number which corresponds to the last Input, Read, or Get statement. It tells you which one it last came across in the program.

Input=0. Read=152. Get=64.

PEEK(57) and PEEK(58): These two locations work together to produce a total number which is where the program in memory was either stopped or ended. Both locations must be read to get the correct number. Take the value of location (58) and times it by 256, then add to this the value of location (57) ie:

If PEEK(57)=124 and PEEK(58)=21 then you are on line 5500. Because (21*256)+124=5500.

PEEK(63) and PEEK(64): These locations return the line number of the current Data statement being read. They work in the same way as (57) and (58).

PEEK(69) and PEEK(70): The values held in these locations correspond to the last variable name used. If the last variable used was A then the value of location (69) will be 65. The second location is used only if the variable was a two lettered variable, ie:

If the last variable used was BZ then PEEK(69)=66. PEEK(70)=90.

Refer to the CHR$ table on pages 146-147 of the Vic-20 User Manual for all the correct codes.

PEEK(152): This returns a number which refers to how many files are open at that present time. A value of one is added every time a file is opened, and a value of one is taken away every time a file is closed.

PEEK(214): This returns a number which tells you what row the cursor is on at that present moment. This location can be changed to move the cursor around.

PEEK(215): This location contains the ASCII value of the last key pressed.

PEEK(642): This location returns a number which when multiplied by 256 will give the start of memory location.

PEEK(644): This location returns a number which when multiplied by 256 will give the end of memory location.

PEEK(650): This is the key repeat control area. It can be changed to either 0 or 255.

0=cursor keys repeat only.

255=all keys repeat.

PEEK(646): This location contains the cursor colour value. When Poked with a number between 0 and 7 inclusive the cursor just changes colour. If the number is higher than 7 then the cursor goes into multicolour mode.

PEEK(657): This location can be changed to either 0 or 128. It controls the Shift/Commodore keys, and therefore the ability to change from upper to lower case and vice versa.

0=enabled change.

128=dissabled.

PEEK(36864): Changing the value held in this location enables you to move the screen from left to right and right to left. The normal value here is 12.

PEEK(36865): This holds the value of the vertical position of the screen. Normal value is 37.

PEEK(37159) and PEEK(36967): Both these locations do the same. They change the speed of the cursor. The higher the value Poked in, the slower the cursor will flash, but the programs will run faster.

PEEK(36867): The screen will either lengthen or shorten depending on the value held in this memory location.

PEEK(36870) and PEEK(36871): These two locations hold the values for the position of a light-pen. They hold the X and Y values respectively.

PEEK(36872) and PEEK(36873): These two locations hold the values for the paddles. Two paddles may be connected, and both their values are read here.

JOY DRAW: The program in listing 1 allows you to draw in high resolution by using a joystick, on the unexpanded Vic-20.

Line 10: Sets the screen size to 16 by 10, and changes the screen and border colour.
Lines 20-50: Set up the screen for use and draw a box around it to limit the area which can be used.
Line 100: Converts the joystick port values to X and Y values.
Line 200: This allows the point to move.
Lines 500-600: These lines calculate and plot the point.

BITS 'N' PIECES: To neutralise the Run Stop key, type the following

POKE 45,240:POKE 46,26:POKE 788,194

To neutralise the Restore key, type this

POKE 37150,3

It is possible to turn the Vic-20 off and on again automatically with one command. This also has the advantage though of leaving any machine code routines in memory. The commands are

SYS 64802
or
SYS 64824

If you have a program you would like to safeguard against anyone else then do the following:

Before saving the program on cassette or disc type:

PRINT PEEK(4097),PEEK(4098)

and press Return. The two numbers which it gives you must be noted down or memorised as they will be needed on loading the program.

Now type:

POKE 4097,0:POKE4098,0

and press Return. The program will now not list or run, although it is still in memory. Now save the program as usual and don't forget those numbers. When you want to load the program, do so as usual and then type the following using X and Y as the numbers you memorised.

POKE 4097, X:POKE 4098,Y

and press Return. The program will now run and list etc...

If you are bored of playing space invaders the normal way round try putting something like this in the program. It automatically gives you a totally new game. You're playing upside down. Type in the program on its own and see what you think.

Once it's been run it can be Newed and to go back to upside down mode again just type

POKE 36869,253

and press Return.

```
2 POKE36869,253
5 FOR I=0TO2048 STEP 8
10 FOR Q=0 TO 7
20 POKE5120+Q+I,PEEK(32775+I-Q)
30 NEXTQ,I
```

AUTO BLEEP: This program is for the unexpanded Vic-20. It is designed to give a bleep whenever a key is pressed. The machine code routine is called by the IRQ interrupt every one sixtieth of a second. This is achieved by altering the IRQ jump address stored at locations 788 and 789.

To get rid of the bleep press the Run-Stop and Restore keys together. To restore the bleep type:

SYS 673

and press Return.

```
10 X=673
20 DATA120,169,174,141,20,3,169,2,141,21,3,88,96
30 DATA165,203,201,64,240,25,169
40 DATA5:REM VOLUME
50 DATA141,14,144,169
60 DATA246:REM NOTE
70 DATA141,11,144,162,55,160
80 DATA255:REM LENGTH
90 DATA136,208,253,202,208,248,169,0,141,11,144
100 DATA169,1,141,139,2
110 DATA76,191,234
120 DATA256
130 READA:IF A=256 THEN 150
140 POKEX,A:X=X+1:GOTO130
150 SYS 673
160 NEW
```

On Error Goto: Vic Basic has often been criticised for not having certain advanced features such as there are in BBC Basic. There is however one feature of BBC and Atari Basics which can be quite easily duplicated on a Vic-20 without having to resort to machine code. This short subroutine reproduces the On Error Goto command:

```
100 A$ = "GOTO" + STR$(line
number) + CHR$(13)
110 L = LEN(A$):POKE 198,L
120 FOR A = 1 TO L: POKE 630 + A,
ASC(MID$(A$,A)):NEXTA
```

In line 100 an actual line number must be placed in between the brackets. ■

Listing 1.

```
10 POKE36879,13:POKE36867,21:POKE36864,17:POKE36865,45:POKE36866,144:POKE36869,2
53
20 PRINT "♥":FOR A=1 TO 16:FOR N=1 TO 10:POKE7663+16*N+A,N+10*A-11:NEXTN,A
30 FOR A=5120 TO 7679:POKEA,0:NEXT:POKE37154,127:X=64:Y=80
40 FORA=5120 TO 7679 STEP 160:POKEA,255:POKEA+159,255:NEXT
50 FORA=5121 TO 5278:POKEA,128:POKEA+2400,1:NEXT
100 A=PEEK(37151):X=X+((AAND16)=0):Y=Y+((AAND4)=0):Y=Y-((AAND8)=0)
200 X=X-((PEEK(37152)AND128)=0):F=-((AAND32)=0):IFF=1 THEN 600
500 Y1=Y+5120+160*INT(X/8):POKEY1,PEEK(Y1)OR2↑(7-XAND7):GOTO 100
600 Y1=Y+5120+160*INT(X/8):POKEY1,PEEK(Y1)AND NOT2↑(7-XAND7):GOTO 100
```

Not for the faint of heart

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FOR SPECTRUM 48K

(Vic-20 version also available).

CREATIVE SPARKS

DRAGON K

John Nash raises the chequered flag on a fast machine-code racing game.



Listing 1.

```
1 REM KART for Dragon 32 or 64
2 REM (C) J R G Nash, 1984.
3 REM
4 REM
5 REM
10 GOTO180
20 FORM=1 TO 295:READR:J=J+R
30 JO=INT((JOYSTK(0)-32)/10):JO=JO*30/SP
40 J=J-JO:IFJ<0 THENJ=0
50 POKE28794,J:EXEC28796
60 IFJ<1 ORJ>38 THENGOTO360
70 DE=DE+.05:IFDE>99 THEN340
80 TH=INT(JOYSTK(3)-32)/10:SP=SP-TH:FORD=0 TO 4*(100-SP):NEXT:IF
SP<1 THEN SP=1:IFSP=1 THENGOTO350
90 IFSP>100 THENSP=100
100 FU=FU-SP/1000:PRINT@474,FIX(FU);:PRINT@453,FIX(SP);:PRINT@46
5,FIX(DE);:IFFU<1 THENSP=SP-6:FU=0
110 NEXTM:RESTORE:SOUND150,1:GOTO20
120 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0
130 DATA-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
140 DATA2,2,2,2,2,2,3,3,3,3,2,2,2,1,1,1,1,1,1,0,0,0,0,0,0,0,-1,-
1,-1,-1,-2,-2,-2,-2,-2,-3,-3,-3,-3,-2,-2,-2,-2,-1,-1,-1,-1,0,0,0
,0,0
150 DATA0,0,0,2,2,2,3,3,3,3,3,3,3,3,2,2,2,1,1,0,0,-1,-1,-1,-1,-2
,-1,-2,-2,-2,-1,-1,-1,-1,0,0,0,0,0,0,0,0
160 DATA0,0,0,0,0,0,0,0,0,0,0,-2,-2,-2,-3,-3,-3,-3,-3,-3,-3,-3,-
3,-2,-2,-2,-2,-1,-1,-1,0,0,0,1,1,1,2,2,2,2,2,2,3,3,3,3,3,3,3,3,3
,2,2,2,2,1,1,1,1,0,0,0,0,0,0
170 DATA0,0,0,0,1,1,1,1,1,1,1,1,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,0,0,0,0,0,0,0,0,0,0,
0,0,0,0
180 CLS:CLEAR200,&H6FFF:POKE&HFFD7,0:B$=CHR$(128):PRINT@69,B$;:P
RINT@72,B$:PRINT@76,B$;:PRINT@77,B$;:FORN=81 TO 83:PRINT@N,B$;:N
EXT:FORN=87 TO 90:PRINT@N,B$;:NEXT
190 PRINT@101,B$;:PRINT@103,B$;:PRINT@107,B$;:PRINT@110,B$;:PRIN
T@113,B$;:PRINT@116,B$;:L$=CHR$(138):R$=CHR$(133):PRINT@120,L$;:
PRINT@121,R$:
200 PRINT@133,B$;:PRINT@134,B$;:FORN=139 TO 142:PRINT@N,B$;:NEXT
:FORN=145 TO 147:PRINT@N,B$;:NEXT:PRINT@152,L$;:PRINT@153,R$:
210 PRINT@165,B$;:PRINT@167,B$;:PRINT@171,B$;:PRINT@174,B$;:PRIN
T@177,B$;:PRINT@179,B$;:PRINT@184,L$;:PRINT@185,R$;
220 PRINT@197,B$;:PRINT@200,B$;:PRINT@203,B$;:PRINT@206,B$;:PRIN
T@209,B$;:PRINT@212,B$;:PRINT@216,L$;:PRINT@217,R$;
230 PRINT@358,"(C) J R G NASH  1984":PRINT@489,"PRESS ANY KEY";
240 A$=INKEY$:IFA$=""THEN240
250 CLS:PRINT@0,"L H JOYSTICK (FORE & AFT)",,"TO CONTROL THROTT
LE & BRAKES":PRINT@192,"R H JOYSTICK (SIDE TO SIDE)",,"TO STEER
":PRINT@384,"GET READY!":PRINT@480,"PRESS ANY KEY";
260 A$=INKEY$:IFA$="" THEN260
270 FORM=1 TO 5:FORN=1 TO 30 STEP 3:SOUNDN,1:NEXTN,M
280 FORN=1024 TO 1535:POKEN,RND(128)+127:NEXT:EXEC29024
290 FORN=1024 TO 1535 STEP 64:FORM=0 TO 31 STEP 2:POKEN+M,128:PO
KEN+M+1,207:NEXTM:FORM=0 TO 31 STEP 2:POKEN+M+32,207:POKEN+M+33,
128:NEXTM,N
300 PRINT@267,"WELL DONE!";:EXEC29058
310 TIMER=0:CLS:PRINT@448,"SPEED";:PRINT@460,"DIST.";:PRINT@470,
"FUEL";:RESTORE
320 FORN=1440 TO 1471:POKEN,239:NEXT:FORN=1024 TO 1191:POKEN,175
:NEXT:FU=99:J=21:SP=4:DE=0:POKE28795,130:DE=0
330 GOTO20
340 EXEC29075:PLAY"L12GOGL4D":GOTO370
350 PRINT@448,"STALLED ENGINE":FORN=10 TO 1 STEP-1:SOUNDN,1:NEXT
N:GOTO370
360 CLS0:EXEC29041:FORN=200 TO 1 STEP -20:SOUNDN,1:NEXT
370 TI=FIX(TIMER/50):FORN=1 TO 5000:NEXT:CLS:PRINT@32,"DISTANCE
";FIX(DE);" MILES";:PRINT@96,"TIME ";TI;" SECONDS":PRINT@448,"PR
ESS ANY KEY OR BREAK";
380 A$=INKEY$:IFA$=""THEN380ELSE310
390 N=0
400 READR:N=N+1:GOTO400
```

I HAVE BEEN SURPRISED at the apparent lack of car simulators for the Dragon. True, there are a number of race-circuit programs, but I have yet to see one which gives you the driver's view through the windscreen. I adopted the principle: "If the program you want does not exist, write it yourself!", and set to work.

The assembler routine to move the display was the first and most important task, and after experimenting with a high resolution routine — listing 2 — I decided this was too slow, although it did produce a very nice display. The hex dump and Basic driver are included in case any readers want to experiment with it.

I then wrote a text screen display routine — listing 1 — which is very much faster, and able to take a variable delay loop without becoming absurd! To load this version of the program, first type in the Basic listing 1 and then Save this to tape or disc *without* trying to Run it. If you Run it, it will crash due to calling non-existent code routines. Next, type New, and then load the hexadecimal bytes from the hex dump. A suitable loader is:

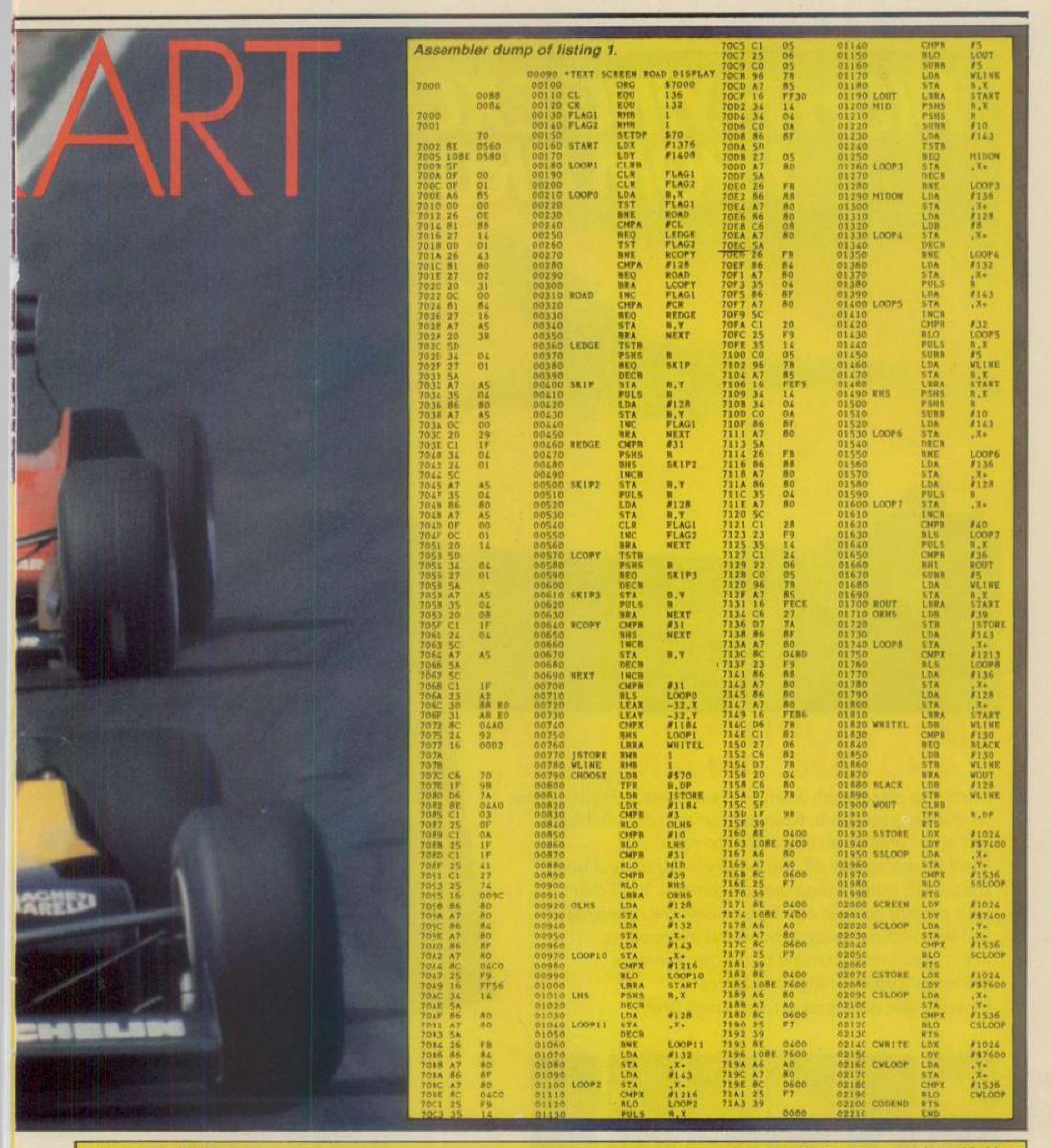
```
10 FOR N = &H7000 TO &H71A3:READA$:
POKEN,VAL("&H" + A$):NEXT
20 DATA C5,45,8E,5,60 etc
```

for as many data statements as you need. It is often convenient to put 10 bytes in a line as in the hex dump. Next do a:

```
CSAVEM"CODE",&H7000,&H71A3,1
```

to store the code on tape. Now you can reload the Basic program and Run to start it. Future loading can be done by loading the code and Basic programs in either order from the tape,

(continued on page 145)



Assembler dump of listing 1.

```
                   00090 *TEXT SCREEN ROAD DISPLAY
7000               00100          ORG     $7000
          0088     00110 CL       EQU     136
          0084     00120 CR       EQU     132
7000               00130 FLAG1    RMB     1
7001               00140 FLAG2    RMB     1
          70       00150          SETDP   $70
7002 8E   0560     00160 START    LDX     #1376
7005 108E 0580     00170          LDY     #1408
7009 5F            00180 LOOP1    CLRB
700A 0F   00       00190          CLR     FLAG1
700C 0F   01       00200          CLR     FLAG2
700E A6   85       00210 LOOP0    LDA     B,X
7010 0D   00       00220          TST     FLAG1
7012 26   0E       00230          BNE     ROAD
7014 81   88       00240          CMPA    #CL
7016 27   14       00250          BEQ     LEDGE
7018 0D   01       00260          TST     FLAG2
701A 26   43       00270          BNE     RCOPY
701C 81   80       00280          CMPA    #128
701E 27   02       00290          BEQ     ROAD
7020 20   31       00300          BRA     LCOPY
7022 0C   00       00310 ROAD     INC     FLAG1
7024 81   84       00320          CMPA    #CR
7026 27   16       00330          BEQ     REDGE
7028 A7   A5       00340          STA     B,Y
702A 20   38       00350          BRA     NEXT
702C 5D            00360 LEDGE    TSTB
702D 34   04       00370          PSHS    B
702F 27   01       00380          BEQ     SKIP
7031 5A            00390          DECB
7032 A7   A5       00400 SKIP     STA     B,Y
7034 35   04       00410          PULS    B
7036 86   80       00420          LDA     #128
7038 A7   A5       00430          STA     B,Y
703A 0C   00       00440          INC     FLAG1
703C 20   29       00450          BRA     NEXT
703E C1   1F       00460 REDGE    CMPB    #31
7040 34   04       00470          PSHS    B
7042 24   01       00480          BHS     SKIP2
7044 5C            00490          INCB
7045 A7   A5       00500 SKIP2    STA     B,Y
7047 35   04       00510          PULS    B
7049 86   80       00520          LDA     #128
704B A7   A5       00530          STA     B,Y
704D 0F   00       00540          CLR     FLAG1
704F 0C   01       00550          INC     FLAG2
7051 20   14       00560          BRA     NEXT
7053 5D            00570 LCOPY    TSTB
7054 34   04       00580          PSHS    B
7056 27   01       00590          BEQ     SKIP3
7058 5A            00600          DECB
7059 A7   A5       00610 SKIP3    STA     B,Y
705B 35   04       00620          PULS    B
705D 20   08       00630          BRA     NEXT
705F C1   1F       00640 RCOPY    CMPB    #31
7061 24   04       00650          BHS     NEXT
7063 5C            00660          INCB
7064 A7   A5       00670          STA     B,Y
7066 5A            00680          DECB
7067 5C            00690 NEXT     INCB
7068 C1   1F       00700          CMPB    #31
706A 23   A2       00710          BLS     LOOP0
706C 30   88 E0    00720          LEAX    -32,X
706F 31   A8 E0    00730          LEAY    -32,Y
7072 8C   04A0     00740          CMPX    #1184
7075 24   92       00750          BHS     LOOP1
7077 16   00D2     00760          LBRA    WHITEL
707A               00770 JSTORE   RMB     1
707B               00780 WLINE    RMB     1
707C C6   70       00790 CHOOSE   LDB     #$70
707E 1F   9B       00800          TFR     B,DP
7080 D6   7A       00810          LDB     JSTORE
7082 8E   04A0     00820          LDX     #1184
7085 C1   03       00830          CMPB    #3
7087 25   0F       00840          BLO     OLHS
7089 C1   0A       00850          CMPB    #10
708B 25   1F       00860          BLO     LHS
708D C1   1F       00870          CMPB    #31
708F 25   41       00880          BLO     MID
7091 C1   27       00890          CMPB    #39
7093 25   74       00900          BLO     RHS
7095 16   009C     00910          LBRA    ORHS
7098 86   80       00920 OLHS     LDA     #128
709A A7   80       00930          STA     ,X+
709C 86   84       00940          LDA     #132
709E A7   80       00950          STA     ,X+
70A0 86   8F       00960          LDA     #143
70A2 A7   80       00970 LOOP10   STA     ,X+
70A4 8C   04C0     00980          CMPX    #1216
70A7 25   F9       00990          BLO     LOOP10
70A9 16   FF56     01000          LBRA    START
70AC 34   14       01010 LHS      PSHS    B,X
70AE 5A            01020          DECB
70AF 86   80       01030          LDA     #128
70B1 A7   80       01040 LOOP11   STA     ,X+
70B3 5A            01050          DECB
70B4 26   FB       01060          BNE     LOOP11
70B6 86   84       01070          LDA     #132
70B8 A7   80       01080          STA     ,X+
70BA 86   8F       01090          LDA     #143
70BC A7   80       01100 LOOP2    STA     ,X+
70BE 8C   04C0     01110          CMPX    #1216
70C1 25   F9       01120          BLO     LOOP2
70C3 35   14       01130          PULS    B,X
70C5 C1   05       01140          CMPB    #5
70C7 25   06       01150          BLO     LOUT
70C9 C0   05       01160          SUBB    #5
70CB 96   7B       01170          LDA     WLINE
70CD A7   85       01180          STA     B,X
70CF 16   FF30     01190 LOUT     LBRA    START
70D2 34   14       01200 MID      PSHS    B,X
70D4 34   04       01210          PSHS    B
70D6 C0   0A       01220          SUBB    #10
70D8 86   8F       01230          LDA     #143
70DA 5D            01240          TSTB
70DB 27   05       01250          BEQ     MIDON
70DD A7   80       01260 LOOP3    STA     ,X+
70DF 5A            01270          DECB
70E0 26   FB       01280          BNE     LOOP3
70E2 86   88       01290 MIDON    LDA     #136
70E4 A7   80       01300          STA     ,X+
70E6 86   80       01310          LDA     #128
70E8 C6   08       01320          LDB     #8
70EA A7   80       01330 LOOP4    STA     ,X+
70EC 5A            01340          DECB
70ED 26   FB       01350          BNE     LOOP4
70EF 86   84       01360          LDA     #132
70F1 A7   80       01370          STA     ,X+
70F3 35   04       01380          PULS    B
70F5 86   8F       01390          LDA     #143
70F7 A7   80       01400 LOOP5    STA     ,X+
70F9 5C            01410          INCB
70FA C1   20       01420          CMPB    #32
70FC 25   F9       01430          BLO     LOOP5
70FE 35   14       01440          PULS    B,X
7100 C0   05       01450          SUBB    #5
7102 96   7B       01460          LDA     WLINE
7104 A7   85       01470          STA     B,X
7106 16   FEF9     01480          LBRA    START
7109 34   14       01490 RHS      PSHS    B,X
710B 34   04       01500          PSHS    B
710D C0   0A       01510          SUBB    #10
710F 86   8F       01520          LDA     #143
7111 A7   80       01530 LOOP6    STA     ,X+
7113 5A            01540          DECB
7114 26   FB       01550          BNE     LOOP6
7116 86   88       01560          LDA     #136
7118 A7   80       01570          STA     ,X+
711A 86   80       01580          LDA     #128
711C 35   04       01590          PULS    B
711E A7   80       01600 LOOP7    STA     ,X+
7120 5C            01610          INCB
7121 C1   28       01620          CMPB    #40
7123 23   F9       01630          BLS     LOOP7
7125 35   14       01640          PULS    B,X
7127 C1   24       01650          CMPB    #36
7129 22   06       01660          BHI     ROUT
712B C0   05       01670          SUBB    #5
712D 96   7B       01680          LDA     WLINE
712F A7   85       01690          STA     B,X
7131 16   FECE     01700 ROUT     LBRA    START
7134 C6   27       01710 ORHS     LDB     #39
7136 D7   7A       01720          STB     JSTORE
7138 86   8F       01730          LDA     #143
713A A7   80       01740 LOOP8    STA     ,X+
713C 8C   04BD     01750          CMPX    #1213
713F 23   F9       01760          BLS     LOOP8
7141 86   88       01770          LDA     #136
7143 A7   80       01780          STA     ,X+
7145 86   80       01790          LDA     #128
7147 A7   80       01800          STA     ,X+
7149 16   FEB6     01810          LBRA    START
714C D6   7B       01820 WHITEL   LDB     WLINE
714E C1   82       01830          CMPB    #130
7150 27   06       01840          BEQ     BLACK
7152 C6   82       01850          LDB     #130
7154 D7   7B       01860          STB     WLINE
7156 20   04       01870          BRA     WOUT
7158 C6   80       01880 BLACK    LDB     #128
715A D7   7B       01890          STB     WLINE
715C 5F            01900 WOUT     CLRB
715D 1F   9B       01910          TFR     B,DP
715F 39            01920          RTS
7160 8E   0400     01930 SSTORE   LDX     #1024
7163 108E 7400     01940          LDY     #$7400
7167 A6   80       01950 SSLOOP   LDA     ,X+
7169 A7   A0       01960          STA     ,Y+
716B 8C   0600     01970          CMPX    #1536
716E 25   F7       01980          BLO     SSLOOP
7170 39            01990          RTS
7171 8E   0400     02000 SCREEN   LDY     #1024
7174 108E 7400     02010          LDY     #$7400
7178 A6   A0       02020 SCLOOP   LDA     ,Y+
717A A7   80       02030          STA     ,X+
717C 8C   0600     02040          CMPX    #1536
717F 25   F7       02050          BLO     SCLOOP
7181 39            02060          RTS
7182 8E   0400     02070 CSTORE   LDX     #1024
7185 108E 7600     02080          LDY     #$7600
7189 A6   80       02090 CSLOOP   LDA     ,X+
718B A7   A0       02100          STA     ,Y+
718D 8C   0600     02110          CMPX    #1536
7190 25   F7       02120          BLO     CSLOOP
7192 39            02130          RTS
7193 8E   0400     02140 CWRITE   LDX     #1024
7196 108E 7600     02150          LDY     #$7600
719A A6   A0       02160 CWLOOP   LDA     ,Y+
719C A7   80       02170          STA     ,X+
719E 8C   0600     02180          CMPX    #1536
71A1 25   F7       02190          BLO     CWLOOP
71A3 39            02200 CODEND   RTS
          0000     02210          END
```

Hex dump for listing 1.

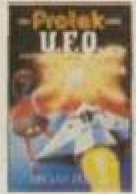
```
28672  C5 45 8E 5 60 10 8E 5 80 5F
28682  F 0 F 1 A6 85 D 0 26 E
28692  81 88 27 14 D 1 26 43 81 80
28702  27 2 20 31 C 0 81 84 27 16
28712  A7 A5 20 38 5D 34 4 27 1 5A
28722  A7 A5 35 4 86 80 A7 A5 C 0
28732  20 29 C1 1F 34 4 24 1 5C A7
28742  A5 35 4 86 80 A7 A5 F 0 C
28752  1 20 14 5D 34 4 27 1 5A A7
28762  A5 35 4 20 8 C1 1F 24 4 5C
28772  A7 A5 5A 5C C1 1F 23 A2 30 88
28782  E0 31 A8 E0 8C 4 A0 24 92 16
28792  0 D2 FF FF C6 70 1F 9B D6 7A
28802  8E 4 A0 C1 3 25 F C1 A 25
28812  1F C1 1F 25 41 C1 27 25 74 16
28822  0 9C 86 80 A7 80 86 84 A7 80
28832  86 8F A7 80 8C 4 C0 25 F9 16
28842  FF 56 34 14 5A 86 80 A7 80 5A
28852  26 FB 86 84 A7 80 86 8F A7 80
28862  8C 4 C0 25 F9 35 14 C1 5 25
28872  6 C0 5 96 7B A7 85 16 F7 30
28882  34 14 34 4 C0 A 86 8F 5D 27
28892  5 A7 80 5A 26 FB 86 88 A7 80
28902  86 80 C6 8 A7 80 5A 26 FB 86
28912  84 A7 80 35 4 86 8F A7 30 5C
28922  C1 20 25 F9 35 14 C0 5 96 7B
28932  A7 85 16 FE F9 34 14 34 4 C0
28942  A 86 8F A7 80 5A 26 FB 86 88
28952  A7 80 86 80 35 4 A7 80 5C C1
28962  28 23 F9 35 14 C1 24 22 6 C0
28972  5 96 7B A7 85 16 FE CE C6 27
28982  D7 7A 86 8F A7 80 8C 4 BD 23
28992  F9 86 88 A7 80 86 80 A7 80 16
29002  FE B6 D6 7B C1 82 27 6 C6 82
29012  D7 7B 20 4 C6 80 D7 7B 5F 1F
29022  9B 39 8E 4 0 10 8E 74 0 A6
29032  80 A7 A0 8C 6 0 25 F7 39 8E
29042  4 0 10 8E 74 0 A6 A0 A7 80
29052  8C 6 0 25 F7 39 8E 4 0 10
29062  8E 76 0 A6 80 A7 A0 8C 6 0
29072  25 F7 39 8E 4 0 10 8E 76 0
29082  A6 A0 A7 80 8C 6 0 25 F7 39
```

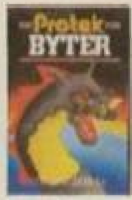
HIGH FLYING EXCITEMENT FROM PROTEK.

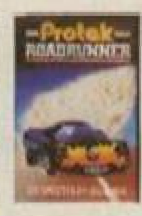
=Protek=
AIRLINER
ZX SPECTRUM 16k & 48k

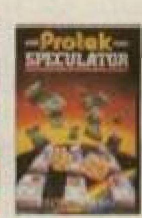
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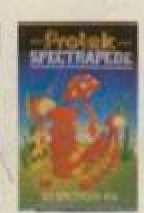














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(continued from page 142)

and then typing Run.

The right-hand joystick gives steering control, moving the road in the correct sense, i.e., opposite to the stick. If you have a 100K ohm potentiometer with a knob that twists, this would give a more realistic control movement.

Your accelerator and brakes are controlled by the left-hand joystick, forwards to go faster, backwards to slow down. In the exact central position, you will coast. Don't worry if you don't have joysticks, as you can control the program from the keyboard. The listing below shows which lines to add/alter, and you will then use the arrow keys for turning and speed control. The shift key gives a sharper turn. You will probably also want to alter line 250 — instructions — to read more appropriately.

On both versions of the program, the kart has a very flexible engine, giving you a speed range of 8-100 mph with no gear changes. You will find that the faster you go, the less cornering ability you have, so you may well crash off the side of the road, to the accompaniment of a suitable display and sound.

Also, your fuel will only get you to the end if you drive at a moderate speed. Watch the fuel gauge. When you crash, stall or finish, you are given a readout of distance and time. Should you actually finish, you will see a chequered flag and hear a suitable tune.

You can design your own course by altering the data statements in lines 120-170, and adding more if necessary. Value 0 gives straight ahead, +1 to +3 gives various degrees of right turn — 3 is the most — and -1 to -3 various degrees of left turn. Do not exceed 3 either way, as your kart cannot turn more sharply than that. When you have put in the data for your new course, type

```
RESTORE:GOTO390
```

which will stop with an O/D ERROR. If you now type

```
PRINTN
```

you will find out how many data values you have entered, and can then put this in the loop counter in line 20. Once the data is used up, the program squeaks and repeats the course.

You might also like to add a score and high score which could be calculated from the time and distance by a suitable equation such as Score = Distance * 10 − (Time) − 250) + a bonus of 500 if you finish.

Note that if your machine will not accept the speed Poke, you will have to remove

```
POKE&HFFD7,0
```

from line 180.

The entry is at line 790 (Choose), with the right road edge stored in JStore. Choose selects the appropriate routine from five alternatives according to the position of the road. OLHS is when the road is off the left-hand side of the screen, so only a single black square and road edge character is printed.

LHS is when the road is partly off the left-hand edge, so less than the full width will be printed. The stored value is used in line 1050 to count how many squares should be printed. If the edge is more than four spaces into the screen, we require a white centre line, so this is printed in line 1180.

Mid achieves the printing when the whole road width is within the screen, and again a white line is needed. All these routines use accumulator offset indexed addressing — for example line 1470 — and most use the stack as a temporary store — for example line 1200.

RHS and ORHS do the same tasks for road positions partly and completely off the right edge of the screen. Note that these routines have to avoid generating any wrap-around, which would spoil the display.

Now we have printed the black line in the middle of the screen, we need to copy it down the screen, widening the road as it comes towards us. We cannot just copy each line downwards with one more black square in the centre, as this would destroy any curves and perspective effects. We need to pull the screen downwards by starting at the bottom and copying each line down into the one below, widening the road as we go. We will work our way up the screen one line at a time until we reach the horizon.

This is done by Start in line 160. This seeks the edge of road characters, 136 and 132, and uses two flags to keep track. Flag 1 is set for road, clear for grass, while Flag 2 is set for right hand grass area, and clear for left hand grass area. The routine then uses LCopy and RCopy to copy the grass verges downwards with outward shift by one square. The edge routines, LEdge and REdge copy the edge characters downwards and outwards, and place a black square just inboard of them. Finally, the Road routine merely does a straight downward scroll, keeping its eye open — line 320 — for the right-hand edge.

When all this scrolling has finished, the white line character is placed in the centre of the road by WhiteL — line 1820. This ensures that a 130 character and a 128 — black — character are printed alternately.

The remainder of the routines at the end of the listing store the text screen contents for instant replay in the event of a crash and a win. They are fairly self evident.

The Basic program is fairly straightforward, using a loop between lines 20-110 which I have kept as simple as possible for speed. The throttle setting alters the speed, which in turn affects a delay loop in line 80. The steering control merely alters the value passed to the machine code by line 50: all the hard work is done in assembler, in which, paradoxically, it is easier to write this sort of routine than in Basic. Probably, the options and thus possible errors are fewer in assembler, so you have to break the process down into simpler logical steps.

The remainder of the program is initialisation routines, titles and frills! The crash sequence and chequered flag are drawn on the screen and then stored by small assembler routines when the program is first run. These displays are then copied onto the screen when needed, by two more small assembler routines in lines 340 and 360. ■

Listing 2.

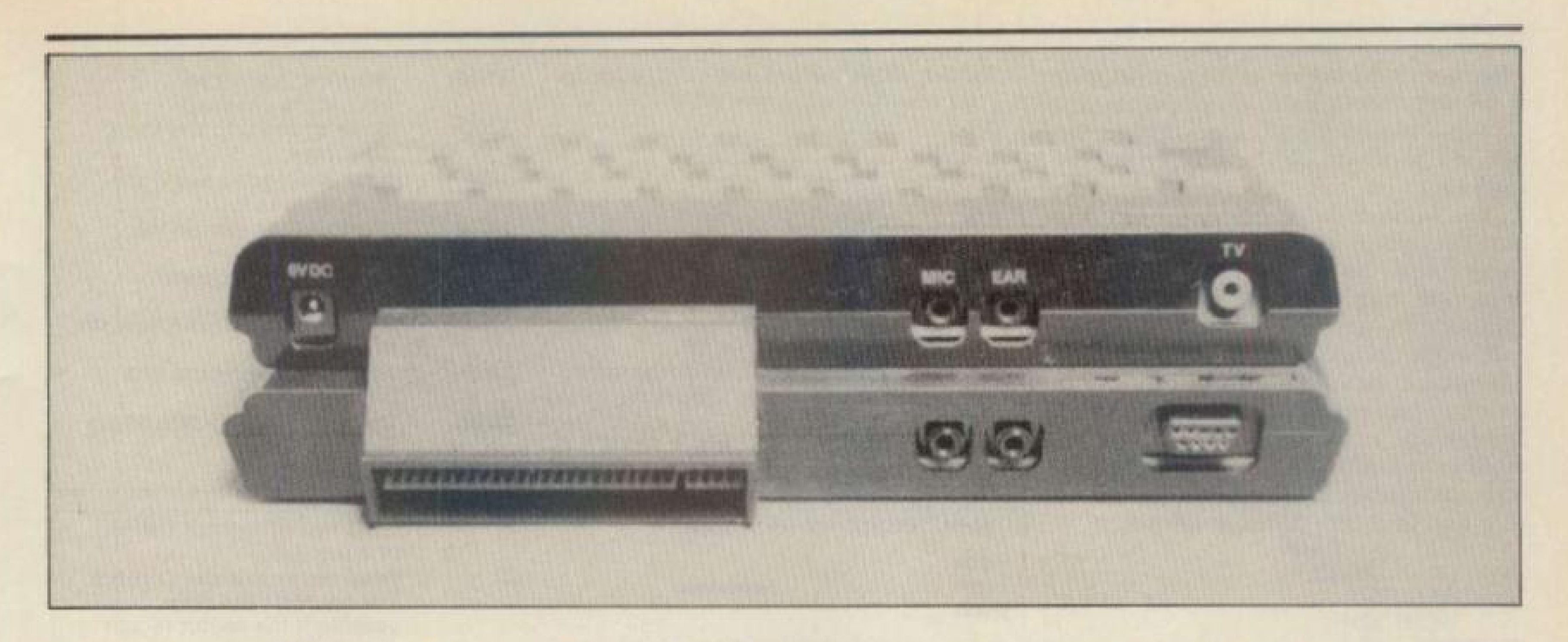
```
1 REM BASIC DRIVER FOR HIRES. ROAD PROGRAM
5 CLEAR200,&H6FFF
10 PMODE3:PCLS:SCREEN1,0
11 LINE(0,0)-(256,79),PSET,B:PAINT(10,10),3,4
20 FORD=1 TO 78:READN:JO=N+64:H2=N+128
25 JS=JOYSTK(0):JP=JS-32:JO=JO-JP:H2=H2-JP
30 LINE(JO,80)-(H2,80),PSET
35 WL=(H2+JO)/2:PSET(WL,80,3)
40 EXEC&H7001
50 LINE(JO,80)-(H2,80),PRESET
60 NEXTD:RESTORE:GOTO20
70 DATA30,30,30,30,30,30,30,30,27,24,21,18,14,10,6,4,4,4,4,4,6,8
,10,12,14,16,18,19,20,21,21,21,21,21,21,23,25,27,29,30,33,33,33,
33,33,33,35,37,40,43,46,49,52,55,58,60,60,60,57,54,51,48,46,44,4
2,40,39,38,37,36,35,34,33,32,31,30,30,30
```

Hex dump for listing 2.

```
28672  C5 8E 17 E0 7F 70 0 A6 82 8C
28682  10 0 23 3D 7D 70 0 26 D 34
28692  2 84 AA 35 2 26 13 A7 88 20
28702  20 E7 4D 27 1B 34 2 43 84 AA
28712  35 2 26 12 20 ED 7C 70 0 A7
28722  88 20 1A 1 66 88 20 66 88 21
28732  20 C9 1A 1 A7 88 20 69 88 20
28742  7F 70 0 20 BC 39 A5 F 0 C
```

Modifications for keyboard use.

```
30 JO=-(PEEK(344)=223)+(PEEK(343)=223)
31 IFPEEK(337)<200THENJO=JO*3
32 JO=JO*30/SP
80 TH=3*(PEEK(341)=223)-3*(PEEK(342)=223):SP=SP-TH:FORD=0 TO 4*(
100-SP):NEXT:IFSP<1 THEN SP=1:IFSP=1 THENGOTO350
375 A$=INKEY$
```



THE MICRODRIVE FILE

Robert Newman continues the Microdrive series.

THE ARRIVAL OF the ZX Microdrive greatly increases the power and versatility of the Spectrum computer. Each Microdrive cartridge can hold about 90K of programs or data and this can be accessed at a reasonably fast speed — typically three or four seconds.

This makes it feasible for a program to store large amounts of data which would not all fit into the memory of the computer in a file on the Microdrive which can be read as needed. This permits the Spectrum to tackle applications such as database management and information retrieval, as well as introducing exciting possibilities for adventure gaming.

The extra commands required for handling Microdrive files, as well as those concerned with the network and RS-232 are dealt with by a new 8K ROM inside Interface 1. The new ROM occupies the same addresses as the first half of the existing ROM, and so they cannot both be in the memory map of the computer at the same time.

The new ROM is therefore only paged in when it is needed for syntax checking or execution of the extended Basic commands, after which control returns to the old ROM. This means that you cannot examine the contents of the new ROM by using PEEK. The easiest way to make a copy of the new ROM so that it can be disassembled is to use a program like:

```
10 CLEAR 40959
20 SAVE *"m";1;"newrom" CODE 0,8192
30 LOAD *"m";1;"newrom" CODE 40960
```

The new ROM can then be examined, remembering to subtract 40960 (= A00) hex) from the addresses. The addresses of seme of the Microdrive routines which I have found are given ir table 1. Some of these are used in the improved catalog routine described here.

If you want to be able to use Microdrive routines in your own machine-code programs, you need to know about how the paging mecharism works, and how files are stored on the Microdrive. The new ROM is paged when a RST 8 instruction is encountered. In the 16K ROM, this restart is used whenever an error occurs during syntax checking or run-time. When the new ROM pages in, it checks to see whether the restart was caused by a "bona-fide" error such as "Out of data", and if so control is passed back to the error routine in the old ROM.

If the restart was due to one of the extended Basic commands — for example Erase — then the error flag is cleared and the appropriate routine in the new ROM called to process the command, after which the new ROM is paged out again. This is not the full story, however, because the authors of the new ROM have also provided a method for machine-code programs to use some of the new routines by following the RST 8 instruction with a data byte called a "hook code".

In your machine code program, RST 8 followed by one of these hook code bytes is equivalent to calling a subroutine in the new ROM. For example:

```
RST 8
DEFB 31H
```

calls a routine which sets up the new system variables used by Interface 1. Twelve of these hook codes are concerned with the Microdrive.

Most of them affect all the main Z-80 registers, and so counters etc. should be pushed to the stack before they are used, as should the alternate pair H'L' otherwise the computer might crash when it returns to Basic.

(continued on next page)

Listing 1. Catalog code dump. 523 bytes, start address = 64000.

207	49	42	101	92	237	91	99	92	167	237	82	1496
125	254	5	56	2	24	8	33	131	6	34	237	915
92	207	50	217	229	217	62	2	205	1	22	205	1509
153	30	237	67	214	92	33	255	255	34	218	92	1680
33	56	250	34	237	92	207	50	225	225	205	109	1723
6	205	232	15	221	126	25	205	247	23	1	255	1561
0	237	67	201	92	205	196	18	205	83	30	32	1366
248	221	126	67	221	182	70	230	2	32	5	205	1609
254	18	24	116	221	126	68	183	32	110	33	11	1196
252	17	12	0	6	0	221	78	13	121	183	40	943
59	229	221	229	197	6	10	35	35	126	221	190	1558
71	32	5	35	221	35	16	245	193	221	225	225	1524
40	70	48	4	25	13	24	221	229	213	197	229	1313
203	33	203	33	96	105	203	33	203	16	9	68	1205
77	225	43	9	235	25	235	237	184	193	209	225	1897
221	229	221	126	67	119	35	221	126	41	119	35	1560
6	10	221	126	71	119	221	35	35	16	247	221	1328
225	221	126	13	60	221	119	13	254	50	40	6	1348
205	18	19	194	77	250	175	205	247	23	221	229	1863
225	17	44	0	25	205	80	29	205	174	251	33	1288
11	252	17	12	0	221	70	13	120	183	202	139	1240
251	221	229	229	213	197	203	86	32	10	205	193	2069
251	62	245	205	102	29	24	110	229	35	126	221	1639
119	13	205	215	251	225	245	175	205	247	23	241	2164
32	95	205	193	251	221	126	82	254	0	40	32	1531
254	3	40	50	62	228	205	102	29	221	126	87	1407
203	119	245	230	31	198	64	205	102	29	241	40	1707
57	62	36	205	102	29	24	50	221	203	90	126	1205
32	44	62	202	205	102	29	221	78	89	221	70	1355
90	205	180	251	24	28	62	175	205	102	29	221	1572
78	85	221	70	86	205	180	251	62	44	205	102	1589
29	221	78	83	221	70	84	205	180	251	205	174	1801
251	193	209	225	221	225	25	5	194	253	250	221	2272
229	205	174	251	205	56	29	123	203	63	215	40	1793
45	215	227	45	205	174	251	221	225	205	196	16	2025
205	0	7	239	160	56	217	225	217	201	62	13	1602
205	102	29	201	221	229	229	215	43	45	215	50	1784
32	225	221	225	201	35	35	6	10	126	183	32	1331
2	62	127	205	102	29	35	16	244	62	32	205	1121
102	29	201	221	126	25	205	247	23	33	240	0	1452
34	201	92	205	196	18	221	126	41	221	190	13	1558
40	7	205	13	19	32	240	60	201	221	229	225	1497
17	67	0	25	205	169	24	205	20	19	192	17	960
15	0	25	205	70	19	201						535

(continued from previous page)

Register IX is used in most of them to point to the start address of the Microdrive channel which is used for reading from or writing to the tape and so should not be altered by your program.

The Microdrive system distinguishes between printfiles and program files. Printfiles are files which can be opened and then written to or read from using Print # and Input #. Program files are Basic programs, arrays or code which can be Saved or Loaded.

If you use the Microdrive hook codes you can only access printfiles. In order to examine program files, you have to keep the new ROM paged in so that routines in it can be called from your machine code program. This can be done with hook code 32 hex as follows:

```
      LD    HL, PAGE
      LD    (23789),HL
      RST   8
      DEFB  32H
PAGE  POP   HL
      POP   HL
```

After you have finished with the new ROM, CALL 700H pages it out again.

The machine code dump in listing 1 is an example of what can be done using the routines in the new ROM. It gives you a greatly improved catalog of all files on a Microdrive cartridge — see figure 1 for an example. This catalog contains details of every file on the tape, including "secret" files saved with a CHR$ 0 as the first character of their filename.

For auto-run Basic programs, it tells you which line number it auto-runs from, and for Code files it tells you the start address which they load at and their length. Arrays which were saved using Data a() are shown in the listing by the word Data followed by the array name. Printfiles are shown by the word Print after their name in the catalog.

You should use the loader program in listing 2 to enter the machine code. After you have typed in each line of numbers, the program will give you a checksum which you should compare with that at the right hand side. If you have made a mistake you can retype that line of data. When you have finished, the code is saved to Microdrive 1. Then New the computer and type in this line:

```
10 CLEAR 63999: LOAD *"m";1;"catcode"
  CODE
```

Then save this with

```
SAVE *"m";1;"cat" LINE 10
```

so that whenever you want to use the routine you can load it with

```
LOAD *"m";1;"cat"
```

To try out the routine, put a test cartridge into drive 1. If you have made a mistake in the machine code there is a risk that the routine might go haywire and corrupt your files, so use a cartridge for your first test where this won't matter too much! Run the routine with the command Randomise 1 * USR 64000, and the catalog should appear.

If CHR$ 0 has been used in the name of a secret file, it is printed as a copyright symbol and secret files always appear at the beginning of the listing. If any other non-printable characters have been used in the name — for example, CHR$ 1 — they appear as a question mark. It will take longer to produce this catalog than the normal one, because a lot more information has to be read in from the tape.

If there is more than one screenfull, the routine will stop and give the "Scroll?" query. If you press any key except N or space, the catalog will continue.

To catalog files on a different drive, use a different number after Randomise — for example Randomise 2 * USR 6400 looks at drive 2. If you miss out the drive number, or use an invalid number, you will get an appropriate error message.

The routine is not relocatable, and it also uses 600 bytes from address 64523 as a data area.

To understand how the routine works it is necessary to know something about how files are stored on the Microdrive. This information will also be useful if you want to write your own machine code programs.

The Microdrive tape is divided up into sectors, each given a different number, starting from zero. Although the system caters for 256 sectors, in practice there are only about 180 usable ones on each tape. Each sector is divided into two parts called the header — 27 bytes long — and record — 540 bytes. There is a short gap on the tape between them.

The main information contained in the header is the name of the cartridge — given when you format the tape — and the sector number. The record is best considered as being in two parts, although there is no actual gap between them on the tape.

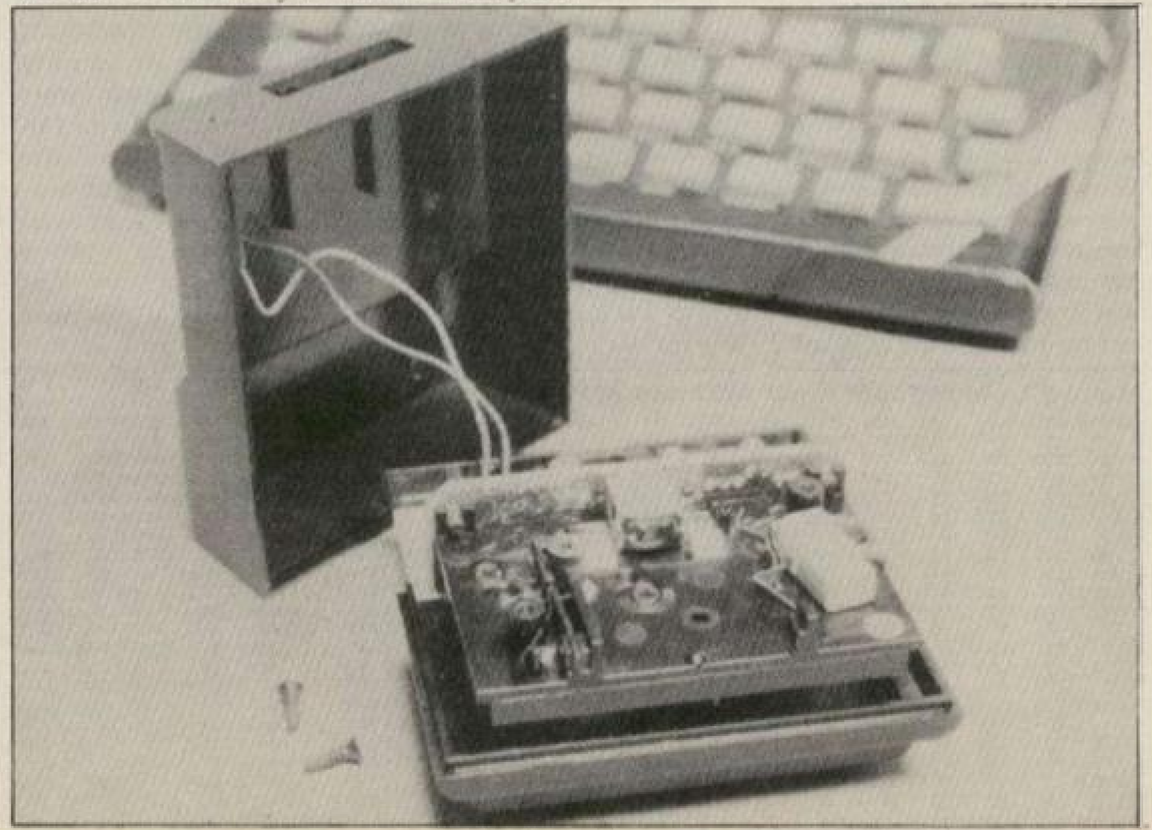
(continued on page 150)

Table 1: Addresses of some of the Microdrive routines in the new ROM.

Start Address (HEX)	Action
0700	Page out new ROM, return 16K ROM.
166D	Check for valid drive number in D-STR1.
1FE8	Set up a temporary Microdrive channel.
10C4	Reclaim Microdrive channel.
112C	Inkey$ from a Microdrive channel.
117D	Load record number CHREC of a file into channel.
11D8	Print a character to Microdrive channel.
120D	Write a record to the Microdrive tape.
1264	Examine map to see if the Microdrive is full.
12C4	Read next header on the tape.
1341/1346	Calculate a checksum.
17F7	Switch a Microdrive motor on or off.
1A09	Read the next record of a printfile.
1B29	Open a temporary Microdrive file.
1C58	Catalog the files.

Table 2: Microdrive hook codes.

Hook code (Hex)	Function
21	Switch Microdrive on (A = 1 to 8), or off (A = 0).
22/2B	Open a temporary Microdrive channel (uses system variables D-STR1, N-STR1, T-STR1). Exits with IX = start address of channel.
23	Close a Microdrive channel.
24	Erase file specified by D-STR1, N-STR1, T-STR1.
25	Read next record of printfile.
26	Write a Microdrive record.
27	Read record number CHREC of a printfile.
28	Read sector number CHREC. The contents are only useable if the sector is part of a printfile.
29	Read the next sector which passes the tape head. Contents only useable if sector part of printfile.
2A	Write channel to sector number CHREC.
2C	Reclaim Microdrive channel area.
32	Call new ROM subroutine addressed by system variable HD 11.



Listing 2. Loader checksum.

```
10 CLEAR 63999
20 LET n=0: LET s=0
30 LET a=64000
40 INPUT b: POKE a,b: PRINT b
50 LET n=n+1: LET s=s+b
60 LET a=a+1
70 IF n=12 THEN  GO SUB 1000
80 IF a<=64522 THEN  GO TO 40
90 GO SUB 1000: IF a$<>"Y" AND a$<>"y" THEN  GO TO 40
100 SAVE *"m";1;"catcode"CODE 64000,523
110 STOP
120 REM ************************
1000 PRINT "Checksum for line = ";s
1010 INPUT "Checksum OK? (Y/N)? ";a$
1020 LET t=r: LET n=0: LET s=0
1030 IF a$="Y" OR a$="y" THEN  PRINT "Continue": RETURN
1040 LET a=a-t
1050 PRINT "Start again from the beginning  of that line."
1060 RETURN
```

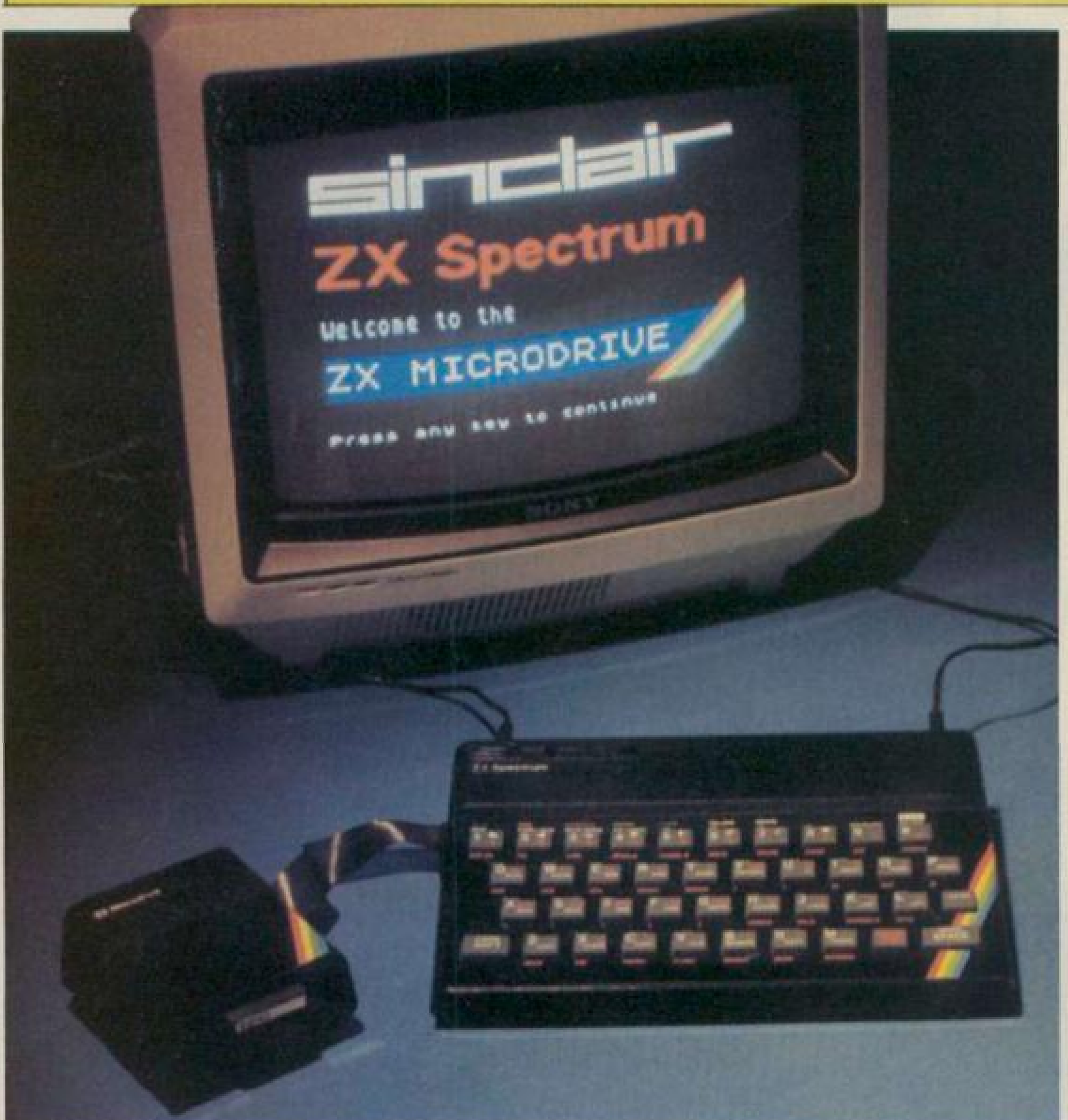


Figure 1. Examples of catalog.

```
Tape 5

@hush-hush
@secret      LINE 10
catcode      CODE 64000,523
chararray    DATA Z$
database     LINE 1
info         PRINT
numbarray    DATA N
testprog

66


Demo

Database     PRINT
Dbase prog   LINE 1
P server
a            LINE 10
editas       CODE 59129,6167
fullcat      CODE 61000,466
headread
m16          LINE 10
monprtcode   CODE 65368,162
musiclabel   LINE 10
net game
run          LINE 10
spritetabs   LINE 10
title ( SCREEN$ ) CODE 16384,691
2

44


Tape 5

@my string   DATA R$
catcode      CODE 64000,523
data         PRINT
epson        LINE 1
pbuff        CODE 23296,256
run          LINE 10

90
```

(continued from page 148)

The first part is the data descriptor section, and holds the name of the file of which this record is a part, the filetype — printfile or program — an end-of-file flag, record number, and the number of bytes of data in the next section, which is the data block. If the record is not the last one in a file, then there will be 512 bytes of data in the data block.

Depending upon the filetype, the data bytes will be either part of a printfile, Basic program, array or machine code. When you save something on the Microdrive, for example a Basic program, it is split up into chunks of 512 bytes and each one written to a different sector on the tape. The first chunk is called record number 0, the next is number 1, and so on, up to the last chunk which is written with a flag to indicate that it is the last record in the file. The system will then be able to load the program in the correct order.

Whenever information is read from or written to the tape, a Microdrive channel is set up as shown in Appendix 3 of the Microdrive and Interface 1 manual. If a file is open for reading, whenever a sector is read from the tape the header information is copied into HDFLG to HDCHK, and the record into RECFLG to DCHK.

If the file is open for writing, these parts of the channel are copied to an unused sector of the tape when the data area is full or when the file is closed. The rest of the channel — ie CHBYTE to CHMAP — is used for more permanent information. During a load, for example, by comparing the filename in CHNAME with the one in a sector just read from the tape — RECNAME — the system knows whether or not that sector is part of the file that is is loading. If so, CHREC and RECNUM can be compared to find out whether or not the record is the next one in the program.

With program files, the first nine bytes in the data area of the first record — number 0 — contain information telling the computer whether the file is a Basic program, an array or a block of code, how long it is, and where to load it into the memory. This is the same sort of information as that which is stored in the header of a cassette tape file when you save it, but is arranged in a different order.

In the Microdrive system, the first byte is a code byte having a value of 0 for a Basic program, 1 for a number array, 2 for a character array and 3 for machine code. The next two bytes give the length of the block. The next two are the start address.

The next two bytes are interpreted differently depending upon whether it is a Basic program or an array, and are not used for machine code. If Basic, they give the length of the program alone — ie. excluding the variables which are also saved — and for arrays only the first byte is used and gives the name of the array — first five bits — and whether it is an array of numbers — bit 6 reset — or characters — bit 6 set. The last two bytes are only used for a Basic program and give the line number if it is auto-run — if not they equal FFFF hex.

Interface 1 and the Microdrives have opened up a new and exciting area of computing for Spectrum owners. As well as being able to access a vast amount of data which can be stored off-line on the Microdrives, with all the possibilities that this opens up for games as well as serious applications, you can also link several Spectrums together on the network, or communicate with other computers via the RS-232.

The new ROM also allows you to add your own commands, and this greatly enhances the versatility of the computer. With a knowledge of machine code the capabilities of the system can be stretched even further, and some of the techniques associated with disc-based systems could be attempted. For example it should be possible to create pseudo-random access files on the Microdrive rather than being limited to the sequential data files which are provided by Basic.

This would result in much faster access for database type programs. A machine code program should also be able to update records or write information to the end of an existing file without needing to create another file to copy the unchanged records to. ■

Unlock Your Imagination



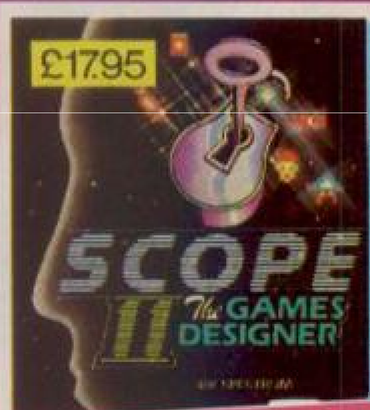
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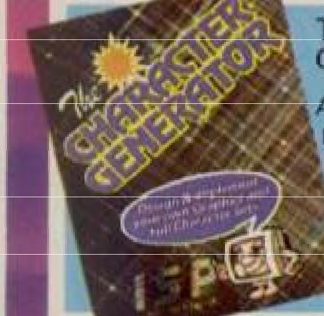
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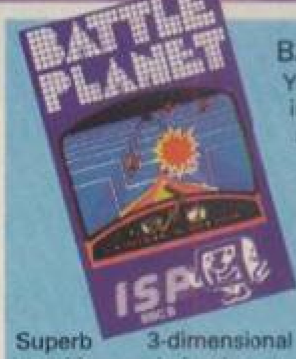


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BBC B

£6.95



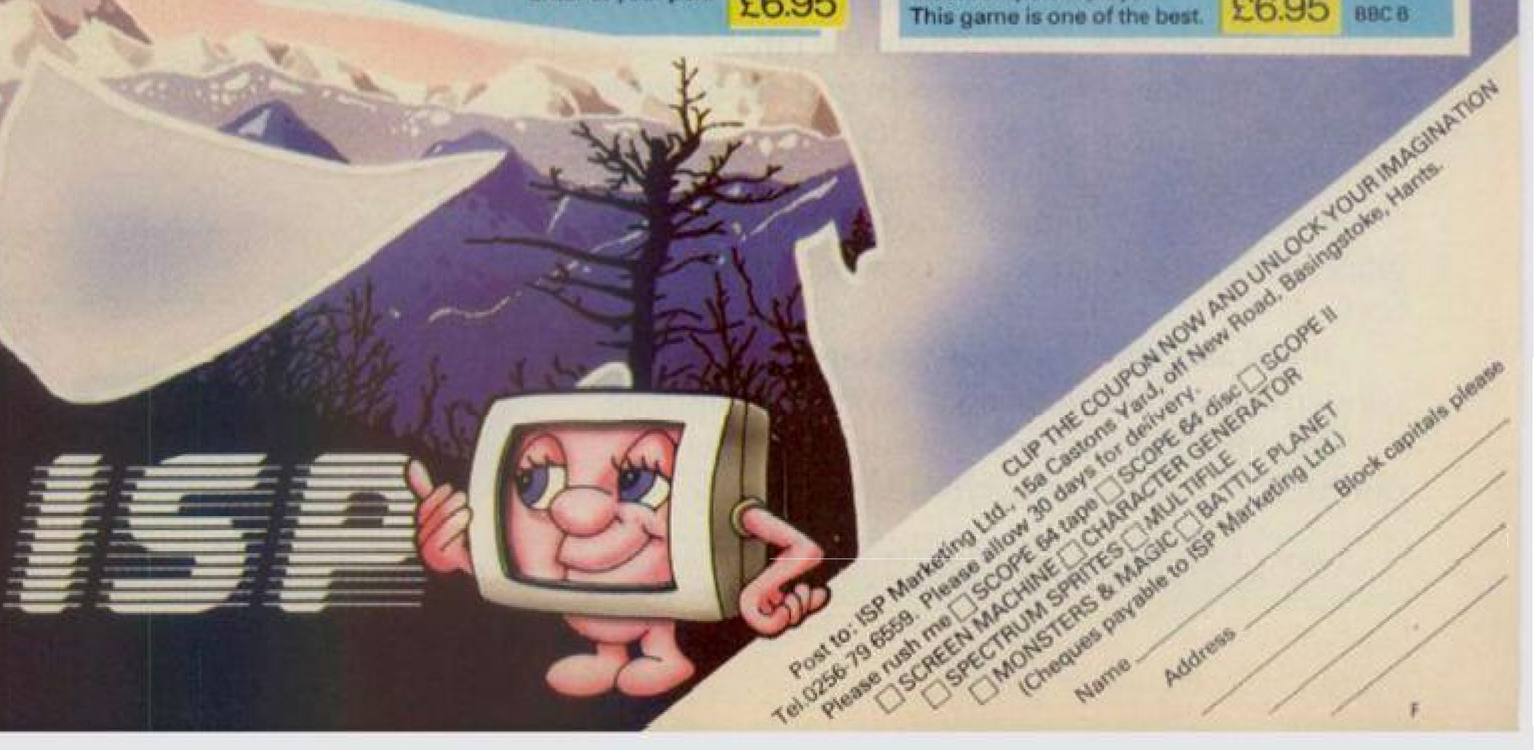
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BBC B



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Dennis Salisbury explores strange new worlds with the Oric.

THIS PROGRAM IS similar to the popular computer game Star Trek written for the 48K Oric-1. I see no reason why it should not work on the Atmos, but unfortunately it will not fit on the 16K Oric-1. To save the program type:

CSAVE "TREK", AUTO

This will run the program automatically when it is loaded.

The galaxy is made up of 8 by 8 sectors of which a maximum of nine can be seen on the LRS — long range scanner — at a time. The starship is always shown in the middle of the sectors displayed. The edge of the galaxy is represented by rows of columns of Xs and if you cross this you will be destroyed.

To move sectors press 1 followed by the appropriate cursor key and the display will be redrawn to show your new position.

To change to the short-range scanner press #2 and the present display is replaced by a view of the entire sector in which you are positioned with anything else which is in that sector. A list of six possible orders are displayed on the right-hand side of the screen. These are as follows:

■ Move — pressing 1 will cause the prompt Direction? to appear. You should now press the cursor key corresponding to the direction you wish to move and then enter the warp — followed by Return — which will move the enterprise that many places in the appropriate direction.

■ Phasers — when you press 2 you then have to enter the energy — followed by Return — that you wish to use. Every time you fire your phasers at a Romulan or Klingon, the enemy ships will lose energy until it is zero and they are destroyed. The amount of energy needed to destroy a Romulan or Klingon depends how close you are. It should range from about 50-200 units.

■ Torpedos — when you press 3 you can fire a single torpedo in one of eight possible directions. These are:

```
 7  0  1
  \ | /
6 --+-- 2
  / | \
 5  4  3
```

■ Dock — if you find a starship you can dock with it by moving to the position immediately above or below it, and pressing 4. This will replenish shields, phasers, torpedos, fuel and crew.

■ Land — if you move into a position immediately next to a planet you can beam down to the planet by pressing 5. Awaiting on the planet's surface is one of six different surprises ranging from hostile attackers to rooms of treasure which can only be obtained by working out the combination of the lock on the door.

■ LRS — pressing 6 will return the display to long range scanner and status report.

Moving one whole sector uses up 50 units of fuel and moving one place within a sector uses up two units of fuel. Commands such as Beam Back to Ship and Strike Quickly can be carried out by pressing any key.

The starship can be destroyed in the following ways: running out of fuel; losing too many crew; being attacked while crew are on planets surface; being attacked by enemy ships when shields have insufficient energy; trying to cross the galaxy border.

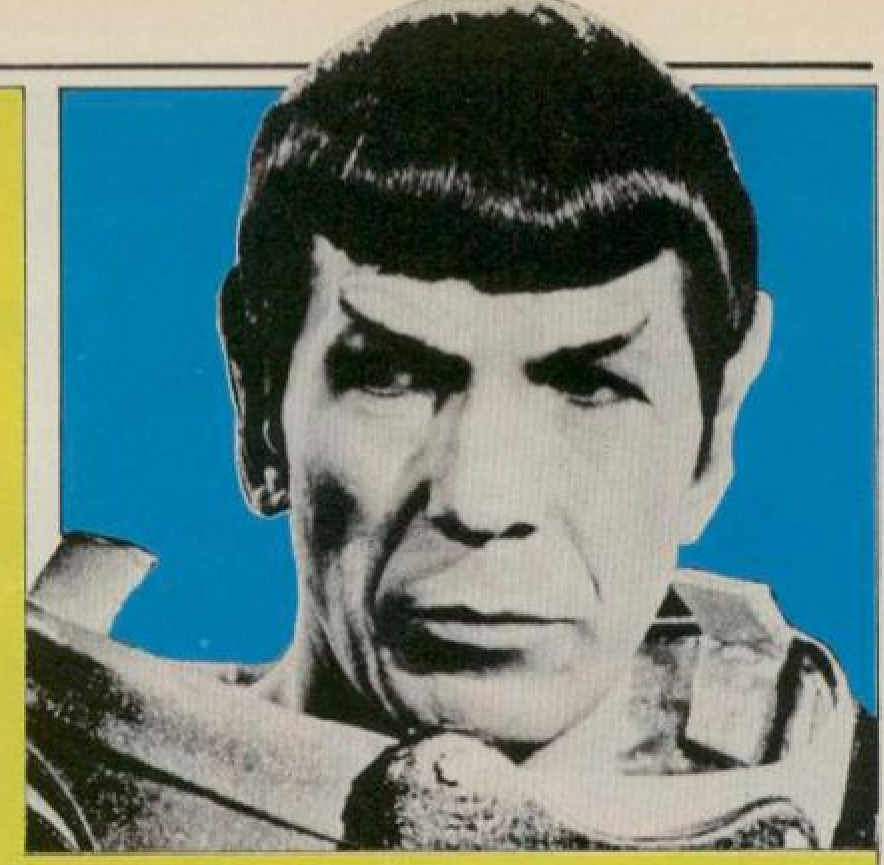
The object of the game is simply to destroy all the Romulans and Klingons and at the same time collect as much treasure as possible.

```
1 FOR I=0 TO FEEK(#276):A=RND(1):NEXT
2 INK7:PAPER0:PRINTCHR$(6)
5 PRINT CHR$(17)
7 DIM KE(20),RE(20)
8 FOR I=1 TO 4:POKE#BBA3+I,32:NEXT I
10 GOSUB 500
20 GOSUB 700
30 GOSUB 1000
40 GOSUB 1100
50 GOSUB 1500
60 GOSUB 2000
70 IF F=0 THEN 95
80 GOSUB 2300
90 GOTO 50
95 GOSUB 2500
96 CLS
97 IF CO=0 THEN 101
98 CO=0
99 PLOT 30,2,'RED ALERT"
100 PLOT 29,2,1:PLOT 28,2,12:GOTO 110
101 PLOT 30,2,"CONDITION"
102 PLOT 32,3,"GREEN"
103 PLOT 31,3,2
110 GOSUB 3000
114 GOSUB 3500
115 IF AN%=1 THEN GOSUB 3600
120 IF AN%=2 THEN GOSUB 4000
130 IF AN%=3 THEN GOSUB 4500
140 IF AN%=4 THEN GOSUB 5000
150 IF AN%=5 THEN GOSUB 5200
151 IF AN%=6 THEN 155
153 GOSUB 6000
154 IF AN%<>6 AND CO=1 THEN EXPLODE
155 IF AN%=6 THEN CO=0:GOTO 50
160 IF H=1 THEN H=0:GOTO 95 ELSE 96
490 PRINT CHR$(17)
495 END
500 FOR CH=1 TO 7
510 READ AS
520 E=46080+8*AS
530 FOR DF=E TO E+7
540 READ BI
550 POKE DF,BI
555 NEXT DF
560 NEXT CH
600 DATA 38,45,45,63,45,30,63,63,30
610 DATA 96,17,31,31,31,21,4,4,14
620 DATA 95,33,33,51,63,63,63,45,12
630 DATA 64,8,42,28,54,34,54,28,42
640 DATA 35,12,22,57,47,51,30,12,0
650 DATA 42,0,0,12,30,30,12,0,0
660 DATA 45,0,0,0,127,0,0,0,0
670 RETURN
700 CLS
720 PRINT
730 PRINT CHR$(4);
740 PRINT CHR$(27);"J          *  STAR & TREK  *"
```

(listing continued on next page)

(listing continued from previous page)

```
745 PRINT
750 PRINT CHR$(27);"J                -----------------"
760 PRINT CHR$(4)
770 PRINT
780 PRINT"   You are now the Captain of the "
790 PRINT"USS Enterprise and your crew awaits"
800 PRINT"your orders.You will see your ship on"
810 PRINT"the Long Range Scanner which divides"
820 PRINT"the galaxy up into 64 sectors,but you"
830 PRINT"can only see up to 9 sectors at any"
840 PRINT"one time,so you are not always sure"
850 PRINT"exactly where you are.You must not go"
860 PRINT"off the edge of the galaxy(xxxxxxx)"
870 PRINT"but you may move sectors by pressing "
875 PRINT"1 and then the relevant cursor key."
880 PRINT"   To display the Short Range"
890 PRINT"Scanner press 2 .This will display"
900 PRINT"one whole sector and whatever else is"
910 PRINT"in that sector."
915 PRINT
920 PRINT"      Press any key to continue."
930 B$=KEY$
940 IF B$="" THEN 930
945 CLS
947 PRINT"  Your mission is to rid the galaxy"
949 PRINT"of the Klingons and Romulans and get"
950 PRINT"as much treasure as possible from the"
951 PRINT"many planets.However,you will lose if"
953 PRINT"you run out of fuel or you are attac-"
954 PRINT"ked with insufficient shield strength"
955 PRINT".Maximum power can be regained only "
956 PRINT"by docking with a Starbase,several of"
957 PRINT"which are scattered over the galaxy."
958 PRINT"Your status report will be on the "
959 PRINT"screen at all times and the various"
960 PRINT"orders you may give will also be on"
961 PRINT"the screen."
962 PRINT"          Good luck"
965 PRINT
970 PRINT"  Press any key to start"
975 C$=KEY$
980 IF C$="" THEN 975
990 RETURN
1000 CLS
1010 PRINT
1020 PRINT CHR$(4);CHR$(27);"J  ** CHARACTER DEFINITI
ONS **"
1025 PRINT CHR$(4)
1030 PLOT 5,8,"& - USS Enterprise"
1035 PLOT 5,10,"@ - Starbase"
1040 PLOT 5,12,"_ - Romulan ship"
1045 PLOT 5,14,96
1050 PLOT 6,14," - Klingon ship"
1055 PLOT 5,16,"# - Planet"
1060 PLOT 5,20,"Press any key to continue"
1065 D$=KEY$
1070 IF D$="" THEN 1065
1080 RETURN
1100 UX=INT(RND(1)*8+1)
1115 UY=INT(RND(1)*8+1)
1120 SX=INT(RND(1)*28+1)
1125 SY=INT(RND(1)*20+1)
1140 FOR K=1 TO 20
1145 KX=INT(RND(1)*8+1)
1150 KY=INT(RND(1)*8+1)
1155 IF KP(KX,KY)=2 THEN 1145
1160 KP(KX,KY)=KP(KX,KY)+1
1170 RX=INT(RND(1)*8+1)
1180 RY=INT(RND(1)*8+1)
1185 IF RP(RX,RY)=2 THEN 1170
1190 RP(RX,RY)=RP(RX,RY)+1
1195 NEXT K
1200 FOR S=1 TO 5
1210 BX=INT(RND(1)*8+1)
1220 BY=INT(RND(1)*8+1)
1230 BP(BX,BY)=BP(BX,BY)+1
1240 NEXT S
1250 FOR P=1 TO 40
1260 PX=INT(RND(1)*8+1)
1270 PY=INT(RND(1)*8+1)
1275 IF PL(PX,PY)=1 THEN 1260
1280 PL(PX,PY)=PL(PX,PY)+1
1285 OP(PX,PY)=INT(RND(1)*6+1)
1290 NEXT P
1295 DD=DD+1000
1300 SH=1000
1305 PH=500
1310 TP=20
1315 TR=0
1317 CO=0
1320 FU=1000
1325 CR=283
1330 NK=20:NR=20
1340 FOR I=1 TO 20
1345 KE(I)=10+KE(I)
1350 RE(I)=10+RE(I)
1360 NEXT I
1400 RETURN
1500 CLS
1530 IF UX<2 THEN P=8 ELSE P=4
```



```
1540 IF UX>7 THEN Q=12 ELSE Q=16
1550 IF UY<2 THEN R=8 ELSE R=4
1560 IF UY>7 THEN S=12 ELSE S=16
1570 FOR I=P TO Q STEP 4
1580 FOR J=R TO S
1590 PLOT I,J,"+"
1600 NEXT J
1605 NEXT I
1610 FOR I=R TO S STEP 4
1615 FOR J=P TO Q
1620 PLOT J,I,"+"
1630 NEXT J
1635 NEXT I
1640 IF UX>2 THEN 1700
1660 FOR B=R TO S
1670 PLOT P,B,"x"
1680 NEXT B
1690 GOTO 1750
1700 IF UX<7 THEN 1750
1710 FOR B=R TO S
1720 PLOTQ,B,"x"
1730 NEXT B
1750 IF UY>2 THEN 1800
1760 FOR B=P TO Q
1770 PLOT B,R,"x"
1780 NEXT B
1790 GOTO 1850
1800 IF UY<7 THEN 1850
1810 FOR B=P TO Q
1820 PLOT B,S,"x"
1830 NEXT B
1850 PLOT 10,10,"&"
1860 RETURN
2000 PLOT 7,1,"Long Range"
2006 PLOT 9,2,"Scanner"
2010 PLOT 24,4,"Satus Report"
2015 PLOT 24,5,"------------"
2020 PLOT 23,7,"Shields  -"
2025 PLOT 33,7,STR$(SH)
2030 PLOT 23,9,"Phasers  -"
2035 PLOT 33,9,STR$(PH)
2040 PLOT 23,11,"Torpedos -"
2045 PLOT 33,11,STR$(TP)
2050 PLOT 23,13,"Treasure -"
2055 PLOT 33,13,STR$(TR)
2060 PLOT 23,15,"Fuel     -"
2065 PLOT 33,15,STR$(FU)
2070 PLOT 23,17,"Crew     -"
2080 PLOT 33,17,STR$(CR)
2090 PLOT 23,19,"Klingons -"
2095 PLOT 33,19,STR$(NK)
2097 PLOT 23,21,"Romulans -"
2098 PLOT 33,21,STR$(NR)
2100 PLOT 4,20,"You can-"
2110 PLOT 3,21,"1. MOVE SECTORS"
2120 PLOT 3,22,"2. CHANGE SCANNER"
2130 AN$=KEY$
2140 IF AN$<>"1" AND AN$<>"2" THEN 2130
2145 D=VAL(AN$):GOSUB 8000
2150 IF AN$="1" THEN F=1 ELSE F=0
2180 RETURN
2300 PLOT 3,25,"Direction?"
2320 D$=KEY$
2330 IF D$="" THEN 2320
2340 IF ASC(D$)<8 OR ASC(D$)>11 THEN 2320
2350 M=ASC(D$)
2355 D=M-5:GOSUB 8000
```

(listing continued on page 156)

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(listing continued from page 154)

```
2360 IF M=8 THEN UX=UX-1
2370 IF M=9 THEN UX=UX+1
2380 IF M=10 THEN UY=UY+1
2390 IF M=11 THEN UY=UY-1
2400 FU=FU-50
2410 GOSUB 10000
2420 RETURN
2500 IF KP(UX,UY)=0 THEN 2560
2522 CO=1
2525 FOR K=1 TO KP(UX,UY)
2530 RK(K)=INT(RND(1)*28+1)
2540 SK(K)=INT(RND(1)*20+1)
2555 NEXT K
2560 IF RP(UX,UY)=0 THEN 2620
2565 CO=1
2570 FOR R=1 TO RP(UX,UY)
2580 RR(R)=INT(RND(1)*28+1)
2590 SR(R)=INT(RND(1)*20+1)
2610 NEXT R
2620 IF BP(UX,UY)=0 THEN 2700
2630 FOR S=1 TO BP(UX,UY)
2640 RB(S)=INT(RND(1)*28+1)
2650 ST(S)=INT(RND(1)*20+1)
2670 NEXT S
2700 IF PL(UX,UY)=0 THEN 2750
2710 FOR P=1 TO PL(UX,UY)
2720 GP(P)=INT(RND(1)*28+1)
2730 SP(P)=INT(RND(1)*20+1)
2745 NEXT P
2750 RETURN
3000 PLOT 32,5,"Orders-"
3020 PLOT 32,6,"-------"
3025 PLOT 29,8,"1. MOVE"
3030 PLOT 29,10,"2. PHASERS"
3035 PLOT 29,12,"3. TORPES"
3040 PLOT 29,14,"4. DOCK"
3050 PLOT 29,16,"5. LAND"
3060 PLOT 29,18,"6. IRS"
3100 PLOT SX,SY,"&"
3120 IF KP(UX,UY)=0 THEN 3160
3122 CO=1
3125 FOR K=1 TO KP(UX,UY)
3150 PLOT RK(K),SK(K),96
3155 NEXT K
3160 IF RP(UX,UY)=0 THEN 3220
3165 CO=1
3170 FOR R=1 TO RP(UX,UY)
3200 PLOT RR(R),SR(R),"_"
3210 NEXT R
3220 IF BP(UX,UY)=0 THEN 3300
3230 FOR S=1 TO BP(UX,UY)
3260 PLOT RB(S),ST(S),"#"
3270 NEXT S
3300 IF PL(UX,UY)=0 THEN 3350
3310 FOR P=1 TO PL(UX,UY)
3340 PLOT GP(P),SP(P),"*"
3345 NEXT P
3350 GET AN$
3355 IF ASC(AN$)<48 OR ASC(AN$)>54 THEN 3350
3360 AN=VAL(AN$)
3370 D=AN:GOSUB 8000
3400 RETURN
3500 IF KP(UX,UY)=0 THEN 3550
3520 FOR I=1 TO KP(UX,UY)
3530 DK(I)=((RK(I)-SX)^2+(SK(I)-SY)^2)^0.5
3540 NEXT I
3550 IF RP(UX,UY)=0 THEN 3590
3560 FOR I=1 TO RP(UX,UY)
3570 DR(I)=((RR(I)-SX)^2+(SR(I)-SY)^2)^0.5
3580 NEXT I
3590 RETURN
3600 PLOT 29,20,"Direction?"
3620 GET D$
3630 IF ASC(D$)<8 OR ASC(D$)>11 THEN 3620
3640 M=ASC(D$)
3645 D=M-5:GOSUB 8000
3646 INPUT"Warp(1 to 19)";WP
3647 IF WP<1 OR WP>19 THEN 3646
3648 WP=INT(WP)
3650 IF M=8 THEN SX=SX-WP
3660 IF M=9 THEN SX=SX+WP
3670 IF M=10 THEN SY=SY+WP
3680 IF M=11 THEN SY=SY-WP
3690 FU=FU-2*WP
3695 W=0
3700 IF SX>0 AND SX<29 AND SY>0 AND SY<21 THEN 3742
3710 IF SX<1 THEN SX=SX+28:UX=UX-1
3720 IF SX>28 THEN SX=SX-28:UX=UX+1
3730 IF SY<1 THEN SY=SY+20:UY=UY-1
3740 IF SY>20 THEN SY=SY-20:UY=UY+1
3742 IF KP(UX,UY)=0 AND RP(UX,UY)=0 THEN CO=0 ELSE CO
=1
3745 W=1
3750 GOSUB 10000
3800 RETURN
4000 PLOT 29,20,"Energy?"
4020 INPUT EN
4030 IF PH-EN>0 THEN 4100
4040 IF SH+PH-EN>0 THEN 4070
4050 A$="Run out of energy"
4060 GOTO 11000
4070 SH=SH+PH-EN
4080 PH=0
4090 GOTO 4150
4100 PH=PH-EN
4110 ZAP
4150 IF KP(UX,UY)=0 THEN 4250
4160 FOR I=1 TO KP(UX,UY)
4165 DK(I)=((RK(I)-SX)^2+(SK(I)-SY)^2)^0.5
4170 DA(I)=EN/DK(I)
4180 KE(I)=KE(I)-DA(I)
4185 IF KE(I)>0 THEN 4220
4190 PLOT RK(I),SK(I)," ":EXPLODE
4195 KP(UX,UY)=KP(UX,UY)-1:NK=NK-1
4197 IF NK=0 AND NR=0 THEN 12000
4200 IF KE(1)<=0 THEN KE(1)=KE(2):RK(1)=RK(2):SK(1)=S
K(2)
4220 NEXT I
4250 IF RP(UX,UY)=0 THEN 4350
4260 FOR I=1 TO RP(UX,UY)
4265 DR(I)=((RR(I)-SX)^2+(SR(I)-SY)^2)^0.5
4270 DA=EN/DR(I)
4280 RE(I)=RE(I)-DA
4285 IF RE(I)>0 THEN 4320
4290 PLOT RR(I),SR(I)," ":EXPLODE
4295 RP(UX,UY)=RP(UX,UY)-1:NR=NR-1
4297 IF NK=0 AND NR=0 THEN 12000
4300 IF RE(1)<=0 THEN RE(1)=RE(2):RR(1)=RR(2):SR(1)=S
R(2)
4320 NEXT I
4350 IF KP(UX,UY)=0 AND RP(UX,UY)=0 THEN CO=0
4400 RETURN
4500 IF TP>0 THEN 4510
4505 PRINT"Out of torpedoes"
4507 GOTO 4800
4510 PLOT 29,20,"Direction?"
4520 PLOT 32,21,"(0-7)"
4530 GET D$
4535 D=VAL(D$):GOSUB 8000
4540 IF D>7 THEN 4530
4550 IF D=0 OR D=4 THEN TX=0:GOTO4580
4560 IF D>0 AND D<4 THEN TX=1:GOTO 4580
4570 TX=-1
4580 IF D=2 OR D=6 THEN TY=0:GOTO4610
4590 IF D>2 AND D<6 THEN TY=1:GOTO 4610
4600 TY=-1
4610 ZAP
4615 REPEAT
4620 Z=Z+1
4622 K=Z
4625 J=SCRN(SX+Z*TX,SY+Z*TY)
4630 PLOT SX+Z*TX,SY+Z*TY,"*"
4660 IF J=95 OR J=96 THEN Z=0:EXPLODE
4670 IF SX+Z*TX<1 OR SX+Z*TX>28 THEN Z=0
4680 IF SY+Z*TY<1 OR SY+Z*TY>20 THEN Z=0
4690 PLOT SX+Z*TX,SY+Z*TY," "
4700 UNTIL Z=0
4710 IF J<>95 AND J<>96 THEN 4790
4715 IF J=96 THEN 4755
4720 RP(UX,UY)=RP(UX,UY)-1:NR=NR-1
4730 IF SX+K*TX=RR(1) AND SY+K*TY=SR(1) THEN RR(1)=RR
(2):SR(1)=SR(2)
4750 GOTO 4790
4755 KP(UX,UY)=KP(UX,UY)-1:NK=NK-1
4760 IF SX+K*TX=RK(1) AND SY+K*TY=SK(1) THEN RK(1)=RK
(2):SK(1)=SK(2)
4790 TP=TP-1
4795 IF KP(UX,UY)=0 AND RP(UX,UY)=0 THEN CO=0
4797 IF NK=0 AND NR=0 THEN 12000
4800 RETURN
5000 IF SCRN(SX,SY+1)=64 OR SCRN(SX,SY-1)=64 THEN 505
0
5020 PLOT 3,23,"Docking Negative!"
5030 WAIT 100:GOTO 5150
5050 PLOT 3,23,"Docking Affirmative"
5060 MUSIC 2,3,4,10
5070 PLAY 3,0,7,2000
5080 WAIT 15
5085 MUSIC 2,5,10,10
5090 PLAY 3,0,7,2000
5100 WAIT 10:PLAY 0,0,0,0
5110 FU=1000:SH=1000
5120 PH=500
5130 CR=283
5140 TP=20
5145 WAIT 100
5150 RETURN
5200 IF SCRN(SX+1,SY)=35 OR SCRN(SX-1,SY)=35 THEN PN=
1 ELSE PN=0
5220 IF SCRN(SX,SY+1)=35 OR SCRN(SX,SY-1)=35 THEN PN=
1
5230 IF PN=1 THEN 5260
5240 PLOT 3,25,"Beaming not possible"
5245 WAIT 200
5250 GOTO 5400
5260 MUSIC 1,5,8,0
5270 PLAY 3,0,7,2000
5280 WAIT 300
5290 PLAY 0,0,0,0
5300 PLOT 3,25,"You have beamed down safely"
5305 WAIT 300
5307 PLOT 3,25,"                              "
5310 GOSUB 9000
5400 RETURN
6000 IF KP(UX,UY)=0 THEN 6100
6015 FOR I=1 TO KP(UX,UY)
6017 IF DK(I)=0 THEN DK(I)=1
6020 SH=SH-INT(DD/DK(I))
6030 IF SH>0 THEN 6100
6040 GOTO 10000
6100 IF RP(UX,UY)=0 THEN 6200
6110 FOR I=1 TO RP(UX,UY)
6115 IF DR(I)=0 THEN DR(I)=1
```

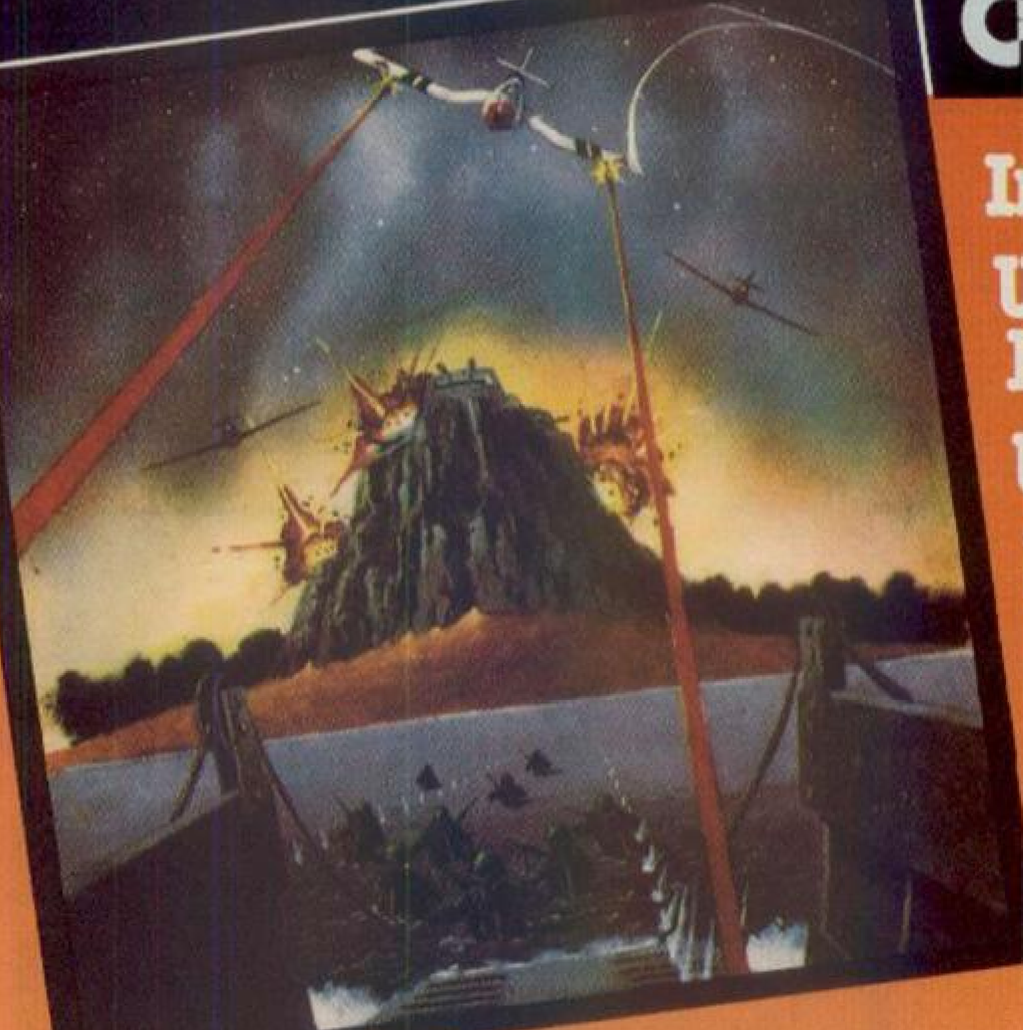
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(listing continued from page 156)

```
6120 SH=SH-INT(500/DR(I))
6140 IF SH>0 THEN 6150
6145 GOTO 10000
6150 CK=INT(RND(1)*16)
6160 CR=CR-CK
6200 RETURN
8000 MUSIC 2,8,D+1,10
8010 PLAY 3,0,7,2000
8020 WAIT 10
8030 PLAY 0,0,0,0
8050 RETURN
9000 IF OP(UX,UY)=0 THEN 9850
9030 IF OP(UX,UY)=2 THEN 9200
9040 IF OP(UX,UY)=3 THEN 9600
9050 IF OP(UX,UY)=4 THEN 9400
9055 IF OP(UX,UY)=5 THEN 9500
9060 IF OP(UX,UY)=6 THEN 9300
9065 PLOT 3,25,"Footsteps approach...":WAIT 200
9070 PLOT 3,25,"Quick!You are being attacked...":WAIT
200
9075 PLOT 3,25,"Beam up to the Enterprise before you
are all killed!"
9077 CK=0
9080 REPEAT
9085 CK=CK+1
9090 BE$=KEY$
9095 IF CK>65 THEN BE$="S"
9100 UNTIL BE$<>""
9105 IF CK<65 AND CK>4 THEN 9110
9106 A$="You have failed your mission,having been kil
led by the attackers"
9107 GOTO 11000
9110 CR=CR-CK
9115 PLOT 3,25,"That was close...!
                "
9120 WAIT 300
9125 PLOT 3,25,"...but you lost  "
9130 PLOT 19,25,STR$(CK)
9135 PLOT 23,25,"crew.":WAIT200
9180 GOTO 9900
9200 PLOT 3,25,"The planet contains crystals...":WAIT
300
9205 PLOT 3,25,"capable of regenerating your phasers"
:WAIT 300
9210 PLOT 3,25,"Beam back up to the ship and install
them"
9220 GET BE$
9230 PH=500
9240 PLOT 3,25,"Crystals installed
     ":WAIT 200
9250 GOTO 9900
9300 PLOT 3,25,"Scanners show planet is rich in fuel"
:WAIT 300
9310 PLOT 3,25,"Beam up to ship with fuel          "
9320 GET BE$
9330 PLOT 3,25,"Fuel now full.              ":WAIT
200
9340 FU=1000
9360 GOTO 9900
9400 PLOT 3,25,"Footsteps approach...":WAIT 200
9410 PLOT 3,25,"Lucky!Friendly inhabitants...":WAIT 2
50
9420 PLOT 3,25,"...but nothing to offer except food."
:WAIT 300
9430 PLOT 3,25,"Beam back to ship.                 "
9440 GET BE$
9450 GOTO 9900
9500 PLOT 3,25,"Footsteps approach...":WAIT 200
9510 PLOT 3,25,"Quick!Its the dreaded beast of Trog..
":WAIT 200
9520 CK=0
9530 PLOT 3,25,"Strike quickly..!
"
9532 TI=0
9533 A$="You have been killed by the beast of trog"
9535 REPEAT
9540 TI=TI+1
9555 B$=KEY$
9557 IF TI>100 THEN B$="S"
9560 UNTIL B$<>""
9562 IF TI>100 THEN 11000
9565 IF TI<15 AND TI>5 THEN 9580
9570 PLOT 3,25,"Missed..!        ":WAIT 200
9575 CK=CK+1:IF CK>5 THEN 11000 ELSE 9530
9580 CR=CR-CK
9590 PLOT 3,25,"You have killed the beast and...":WAI
T 300
9591 PLOT 3,25,"collected 10 units of treasure..":WAI
T 300
9592 PLOT 3,25,"Beam back to ship with the treasure."
9593 GET BE$
9594 TR=TR+10
9595 GOTO 9900
9600 REM
9605 COMB$=""
9610 OP(UX,UY)=0
9620 CLS
9625 PRINT
9630 PRINT" You have found a room which contains"
9635 PRINT"an unknown amount of treasure.But the"
9640 PRINT"door is firmly sealed and can only be"
9645 PRINT"opened by typing in the correct four"
9650 PRINT"number combination of the lock."
9655 PRINT" No two numbers in the combination"
9660 PRINT"are the same,but time is limited and"
9665 PRINT"you only have 6 attempts to guess the"
9670 PRINT"combination."
9675 BASE=INT(RND(1)*4+4)
9680 PRINT" Since the inhabitants use base ";BASE
9685 PRINT"only the numbers 0 to ";BA-1;" will be"
9690 PRINT"included in the combination."
9695 PRINT"(Remember-once you type in a number   you
cannot change it)"
9700 PRINT" Having typed in the combination two"
9702 PRINT"numbers will appear.The first number"
9703 PRINT"represents how many of your numbers "
9704 PRINT"are in the correct position,and the"
9705 PRINT"second represents how many of your"
9706 PRINT"numbers are correct but in the wrong"
9707 PRINT"position."
9709 PRINT:PRINT
9710 PRINT"Press any key to continue"
9712 GET D$
9714 CLS:PRINT
9720 FOR I=1 TO 4
9725 RN(I)=INT(RND(1)*BASE)
9730 IF I=1 THEN 9750
9735 FOR J=1 TO I-1
9740 IF RN(J)=RN(I) THEN 9725
9745 NEXT J
9750 COMB$=COMB$+STR$(RN(I))
9752 NEXT I
9767 FOR GUESS=1 TO 6
9768 CB$=""
9770 PRINT:PRINT"Combination >";
9772 FOR I=1 TO 4
9774 GET D$
9776 IF ASC(D$)<ASC("0") OR ASC(D$)>ASC("0")+BA-1 THE
N 9774
9777 D=VAL(D$):GOSUB 8000
9778 PRINT D$;
9780 CB$=CB$+D$
9782 NEXT I
9784 B=0:W=0
9786 FOR CHECK=1 TO 4
9788 IF VAL(MID$(CB$,CH,1))=RN(CH) THEN B=B+1
9790 FOR WHITE=1 TO 4
9792 IF VAL(MID$(CB$,CH,1))=RN(WH) THEN W=W+1
9794 NEXT WH
9796 NEXT CH
9798 IF B=4 THEN 9820
9800 W=W-B
9802 PRINT SPC(6);B;SPC(8);W
9804 PRINT
9806 NEXT GU
9808 WAIT 200:CLS:PRINT
9810 PRINT"  Hard luck-but it's time to leave."
9812 PRINT" The treasure is gone for good now so"
9814 PRINT" don't come back!"
9816 PRINT" Beam back to ship."
9818 GOTO 9860
9820 CLS:PRINT
9822 PLOT 10,1,"WELL  DONE!"
9824 PLOT 10,2,"WELL  DONE!"
9826 PLOT 9,2,14
9828 PLOT 9,1,14
9830 PRINT:PRINT
9832 TU=INT(RND(1)*21+10)
9833 PRINT:PRINT
9834 PRINT"You have collected ";TU;" units of
 treasure."
9836 PRINT"Beam back to ship with treasure."
9838 TR=TR+TU
9840 GOTO 9860
9850 PLOT 3,25,"No treasure left...             ":W
AIT 200
9855 PLOT 3,25,"Beam back to ship  "
9860 GET BE$
9900 RETURN
10000 IF FU<=0 THEN A$="You have run out of fuel.Game
 over":GOTO 11000
10010 IF SH<0 THEN A$="You have been blown to bits.
Game over":GOTO 11000
10020 IF CR<150 THEN A$="You have lost too many crew.
Game over":GOTO 11000
10030 RETURN
11000 CLS:PLOT 10,10,A$
11010 PLOT 10,15,"Another game(Y/N)?"
11020 GET AN$
11030 IF AN$="N" THEN 495
11040 IF AN$="Y" THEN 11060
11050 GOTO 11020
11060 PLOT 5,17,"Do you need instructions(Y/N)?"
11070 GET AN$
11080 IF AN$="Y" THEN RUN 7
11090 IF AN$="N" THEN CLEAR:DIM KE(20),RE(20):GOTO 40
11100 GOTO 11070
12000 CLS:PRINT
12010 PRINT CHR$(4);CHR$(27);"J            WELL  DONE!
"
12020 PRINT CHR$(4)
12030 PRINT:PRINT
12040 PRINT"  You have defeated the Klingons and"
12045 PRINT"Romulans and collected ";TR;"units of"
12047 PRINT"treasure."
12050 PRINT" Now try again-but this time you will"
12060 PRINT"not find it so easy.They will not be"
12070 PRINT"so easy to destroy and will damage"
12080 PRINT"your ship more."
12085 PRINT
12090 PRINT"    Good luck!"
12100 PRINT
12110 PRINT"  Press any key to start again."
12120 GET D$
12125 FOR X=1 TO 8
12130 FOR Y=1 TO 8
12140 KP(X,Y)=0:RP(X,Y)=0
12150 BP(X,Y)=0:PL(X,Y)=0
12160 OP(X,Y)=0
12170 NEXT Y
12180 NEXT X
12190 GOTO 40
```

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QL Competition RESULTS

APRIL'S BEFORE AND AFTER COMPETITION proves that *Your Computer* readers will do anything to get their hands on a QL — mind you, so would most of the people who sent off their £400 cheques to Sinclair four months ago and are still waiting.

To win a new Sinclair you had to send in a sketch or photograph of your existing computer system — the Before — which would convince us that you needed a tidy QL — the After — to replace it. This seemed to spark all your creative instincts. We were deluged with pictures of very strange looking systems indeed — which could explain why some of you have such difficulty typing in listings.

One of the weirdest entries was neither a sketch nor a photograph but a lump of crushed metal with wires sticking out the end which PJ Thys of Leiden in Holland claims actually is his old computer. Tests by the *Your Computer* forensic laboratory reveal that PJ Thys's lump of metal is a cat hub cap so it's no wonder he wants a QL.

Other odd entries included an anonymous nude picture — of a three year old boy, and from Zunic Davor of Zagreb Yugoslavia a photograph of a snowman with an uncanny resemblance to Sir Clive. Maybe he's been snowed in since the Winter Olympics and that's why we've had to wait for our QLs.

While some sent in accurate detailed drawings of their systems others sent in caricatures — at least that's what we hope they are otherwise there are a lot more of you running Cray 1s off ZX keyboards than we had ever imagined. If Andrew Heggie's sepia drawing is to be believed his home in Glenrothes — Scotland's silicon glen — is dominated by a 1 RAM system, the type that comes complete with horns being pursued by a sheepdog, which includes blackboard, 1920's gramophone and abacus amongst its peripherals.

Malcolm Banthorpe of Northolt, Middlesex, needs a QL because the Galactic Union of Invasion Operatives and Allied Nasties has mounted an official picket of his old American Atari. They are demanding a 16 bit QL — 8 is not enough. Well Malcolm if you will go for an old American trouble shooter you cannot expect us to interfere in your bit strike.

The most popular "Before" was an abacus — we had several hundred of them — and running that close was spaghetti. Fortunately, nobody sent in any half-eaten pasta but Ernest Babbington of Highgate, London, sent in a section of a Heinz wrapper.

Dogs crashing through your systems and cats sitting on over-warm power packs were another obsession of the competitors. Richard Trollis of Oxford was moved to paint a full colour masterpiece of his cat knocking a joystick into the inevitable cup of coffee.

Collages were also popular. Adrian Oates of Guildford included a picture of Sir Clive being swallowed by a Pacman on his — the ultimate video nasty.

Quiche Lorraine "because preparation is lengthy but its worth the wait" was a team entry from Sime, Andy and Deb from Corsham in Wiltshire. It wasn't the best slogan but that's only meant to be a tie-breaker. Instead of a sketch or a photo of their current system they sent in a colourful scale model — not strictly within the rules but in a competition brimming with original entries we felt obliged to show some imagination in our judging so the Corsham trio win the QL for their efforts.

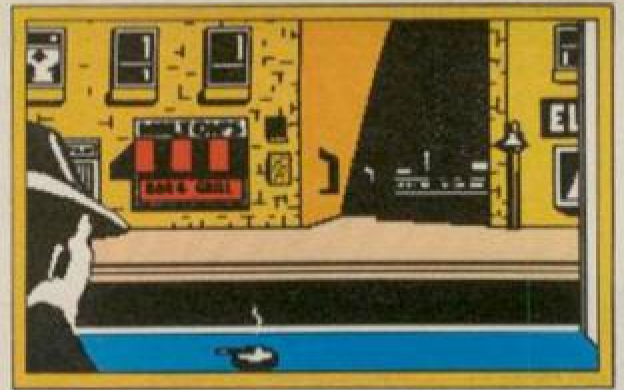








MPETITION
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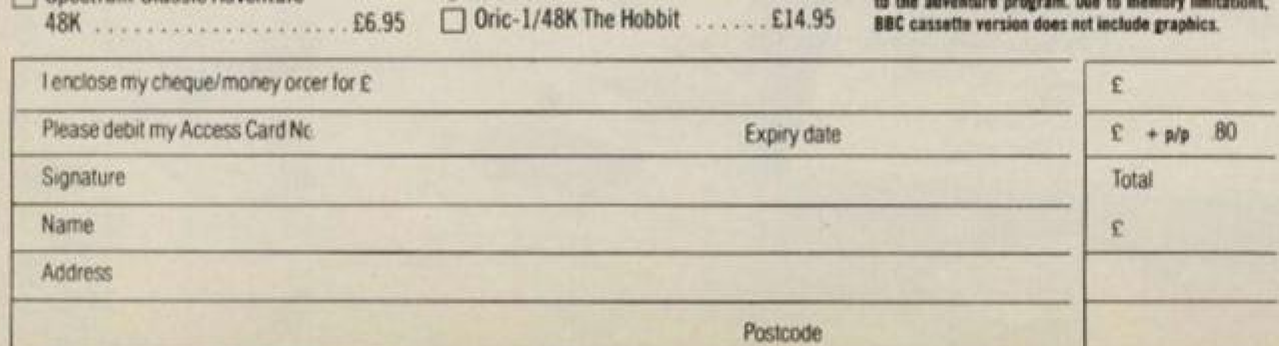
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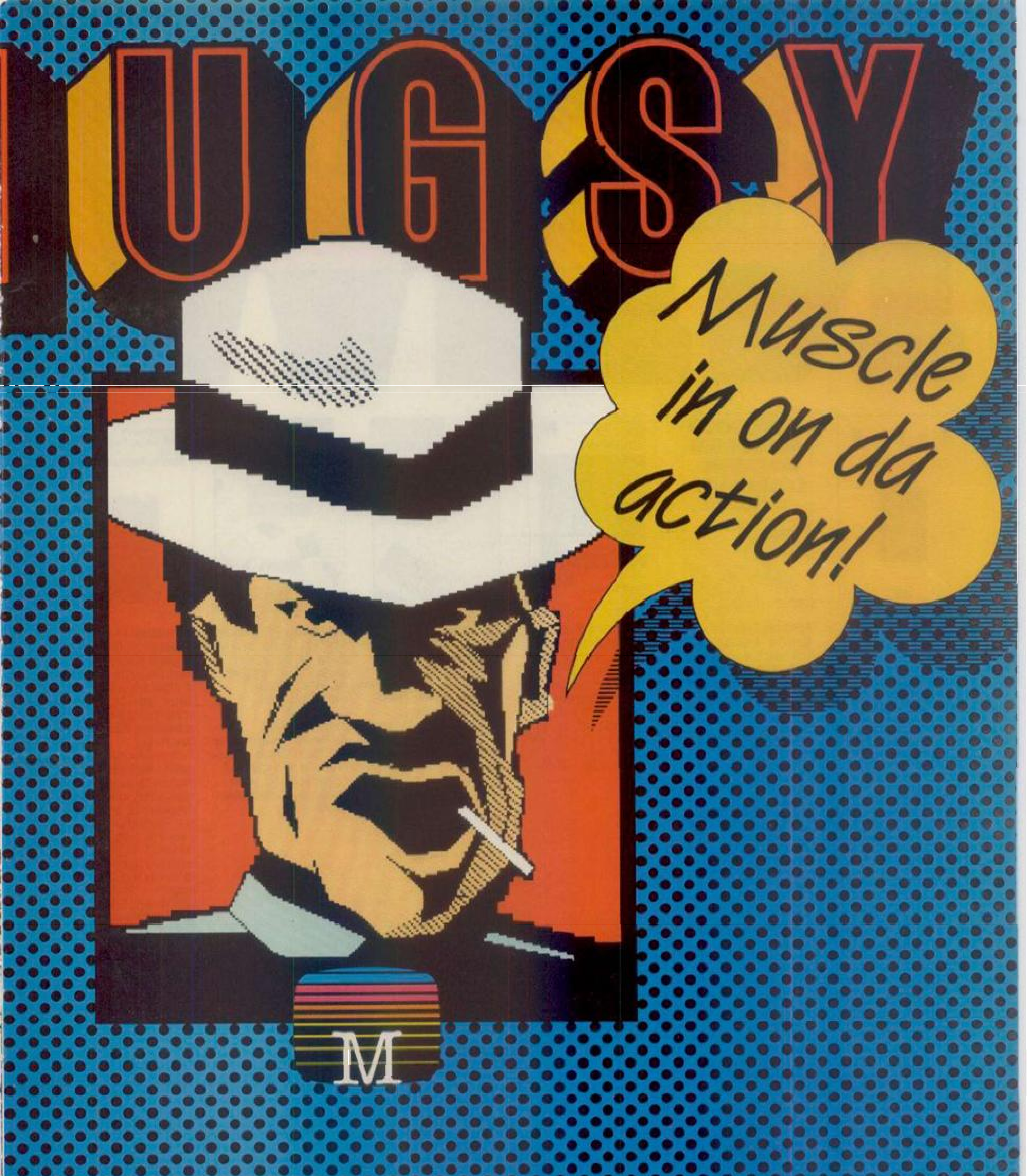
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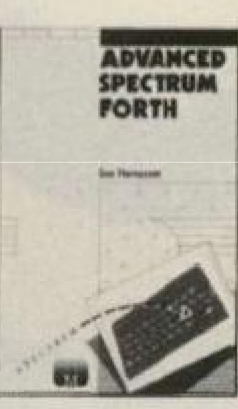
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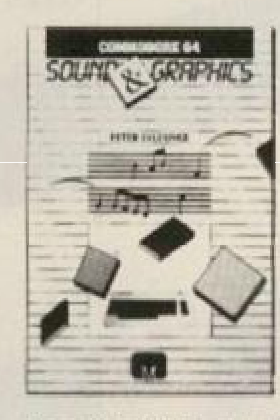


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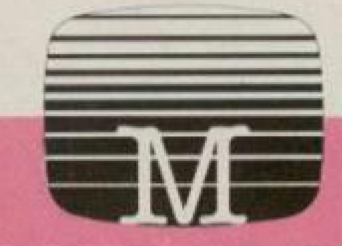
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TEXT EDITOR

An "electronic notepad", which is easily updated with 12 "pages" — Julian Ossowski explains.



Listing 1.

```
10 LET L=0
20 LET A$="XXXXXX 32 X5 XXXXX"
30 LET L=USR 20495
40 IF L=1 THEN COPY
50 IF L=2 THEN LOAD A$
60 IF L=3 THEN SAVE A$
70 RUN
```

Listing 2.

```
 99 REM HEX LOADER
100 PRINT "START ADDRESS"
110 INPUT S
120 PRINT "FINISH ADDRESS"
130 INPUT F
140 FOR N=S TO F STEP 8
150 LET T=0
160 PRINT N;" - ";
170 INPUT A$
180 PRINT A$;" = ";
190 INPUT TOT
200 PRINT TOT
210 LET Z=0
220 FOR K=1 TO LEN A$ STEP 2
230 LET C=(CODE A$(K)-28)*16+CO
DE A$(K+1)-28
240 LET T=T+C
250 POKE N+Z,C
260 LET Z=Z+1
270 NEXT K
280 IF TOT=T THEN GO TO 310
290 PRINT "ERROR - PLEASE INPUT
AGAIN"
300 GO TO 150
310 NEXT N
```

BEING BORED with zapping space invaders, I decided to sit down and write a really useful ZX-81 program, and 'Textpro' was what I came up with. The program is essentially an electronic notepad, allowing access to an infinite number of screens which can easily be updated at any time. The program has the following features:

- Instant access to 12 "pages" stored in memory;
- Saving of pages on tape;
- Editor to write and update pages;
- Help page;
- Two display formats;
- Print function allowing pages to be dumped onto a printer;
- Scroll function for advertising displays etc.

Now onto the program itself, it is largely in Z-80 machine code, and has two parts, the first sets up the machine code, and then loads the second, which is the "slave" program used for storing pages on tape.

Type

POKE 16389,80

and then New, now type in listing 2 and Run it and so load in the machine code.

Now type New and create Rem lines 1-16 each 96 characters long — excluding the Rem — then type

POKE 16511,92 POKE 16512,6

to make one long line, then type

POKE 16510,0

to prevent it from being edited and

POKE 16514,118

and

POKE 16515,118

to prevent it from being listed. Now type

RAND USR 21658

to down load the machine code and save the Rem statement just in case something happens. Now type in the rest of listing 4, start the tape recorder on record and type run.

Type New and type in listing 3, save it just in case, and then Run it.

Command and Edit modes

Now load listing 4 from tape, add line 10 Rand USR 16962 and Run it after setting your tape recorder to record. This is now the complete master program. Now Break out of it.

Type New, type in listing 1, Run it, if all is well a message should appear, press "S", type

SLAVE

between the quotes, and then follow the instructions after pressing newline. This is the complete slave program.

There are two modes, Command and Edit. If you are ever stuck, and you are in Command mode, then if you press H you will get the help page. So after following the procedures above you will have just saved a blank page and you will be back in Command mode so if you press H you will get the help page, which will tell you how to use the system. If you want to type something, you have to go into Edit mode. To do this press shifted one, and a cursor and a message will appear. This editor is very much

(continued on page 167)

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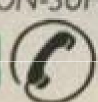


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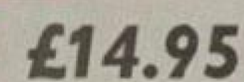
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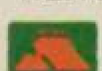



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Listing 3.

```
   5 POKE 16418,0
  10 PRINT
  20 PRINT "EDITING"
  30 PRINT "               PRESS SHIFTED
 """I""" FOR"
  40 PRINT "               EDIT MODE"
  50 PRINT "               USE THE CURSO
R CONTROL"
  60 PRINT "               KEYS AND RUBO
UT"
  70 PRINT "               PRESS SHIFTED
 """A""" WHEN"
  80 PRINT "               YOU HAVE SHIF
TED"
  90 PRINT
 100 PRINT "STORING PAGES"
 110 PRINT "               ON TAPE; PRES
S """S""""
 120 PRINT "               IN MEMORY; PR
ESS """M""""
 130 PRINT
 140 PRINT "RETRIEVING PAGES"
 150 PRINT "               FROM TAPE; PR
ESS"""J""""
 160 PRINT "               FROM MEMORY;
PRESS """R""""
 170 PRINT
 180 PRINT "PRESS """B""" TO SCROL
L PAGES"
 190 PRINT "PRESS """H""" FOR THIS
PAGE"
 200 PRINT "PRESS """I""" TO INVER
T A PAGE"
 210 PRINT "PRESS """V""" TO CLEAR
THE SCREEN"
 220 PRINT "PRESS """Z""" TO PRINT
OUT A PAGE"
 240 PRINT "HELP PAGE:- INFORMAT
ION"
 250 RAND USR 21670
 260 REM THIS INVERTS THE PAGE A
ND STORES IT"
```

Listing 4.

```
   1 REM ************************
         *  J.OSSOWSKI 1984     *
         *  VERSION 4           *
         ************************
  10 RAND USR 16962
  20 SAVE "TEXTPRO"
  30 RAND USR 17643
  40 POKE 16389,80
  50 CLS
  60 PRINT AT 12,6;"TEXTPRO MAST
ER"
  70 PRINT AT 16,7;"STOP THE TAP
E"
  80 PRINT AT 10,7;"PRESS ANY KE
Y"
  90 IF INKEY$="" THEN GOTO 90
 100 CLS
 110 PRINT AT 10,3;"PRESS """J"""
TO LOAD A PAGE"
 120 IF INKEY$<>"J" THEN GOTO 12
0
 130 LOAD ""
```

(continued from page 165)
like the 81's editor in that you can move the cursor around with shifted 5, 6, 7 and 8 and you can also use rubout.

You can store a page in memory by pressing M and then location 0 to 9 — there are two other pages which you can use for temporarily storing pages in: A and B. Retrieving pages is done by pressing R and then the page you want — 0 to B. If you select a page other than 0 to B you will return to Command mode.

To save a page press S and then enter the filename, and follow the instructions. It is a good idea to save the page in memory first in case you cause an input error e.g. rubbing out a quote gives an error.

To load a page, press J and then type the filename — if you do not know this, then just press newline.

If you press B you will scroll through all 12 pages at a moderate rate. If, however, you press any key then they will whizz past your face and you will return to Command mode.

There are a few bytes of system variables in front of the main machine code, one of them being SYSP — the current page number — which is mentioned in the listings. ■

Listing 5.

```
20495 E12200500388850CD = 955
20503 0451FE2E2006CDEB = 863
20511 51C38850FE3B2008 = 848
20519 CD2A0A3E80320450 = 581
20527 C38850FE322006CD = 955
20535 6D51C38850FE3720 = 942
20543 06CD1A51C38850FE = 983
20551 752006CD0553C388 = 779
20559 50FE2D200CCDC051 = 901
20567 CD0451CDC051C388 = 1099
20575 50FE382009CDFE51 = 971
20583 3CFE01C23754FE2F = 949
20591 2006CDFE51C33D54 = 913
20599 FE3F20080101002A = 401
20607 0050E5C9FE27CCE2 = 1203
20615 53CDD951A8848282 = 1290
20623 A6B3A9808284A9AA = 1339
20631 998082A680AA80A6 = 1265
20639 80A8AD84AEA8AA80 = 1289
20647 808080807685A6AC = 1149
20655 AA808080808080AF = 1113
20663 9884838888848C8880 = 1431
20671 AE808090A5A4A080 = 1204
20679 808080808080FF3A04 = 957
20687 502A0C4001FE0209 = 464
20695 77C3185000000000 = 416
20703 0000000000000000 = 0
20711 0000000000000000 = 0
20719 0000000000000000 = 0
20727 0000000000000000 = 0
20735 0000000000CD8802 = 394
20743 444D511428F7CD8D = 927
20751 077EF8CD8B022C20 = 848
20759 FAF1C93E80320450 = 1016
20767 CDD95187AA8987AE = 1398
20775 AA88AA80808CADAE = 1318
20783 A8AD808184A8A689 = 1345
20791 AE84838F80909C96 = 1254
20799 A89180FFCD0451D8 = 1197
20807 1C47E6F0200678FE = 981
20815 0CFA5451C90411D6 = 863
20823 0221425801910FD01 = 484
20831 D602ED5B0C40ED80 = 1033
20839 C69C320450C93E80 = 879
20847 320450CD09518889 = 1006
20855 8487AA80808CADAE = 1324
20863 A8AD808184A8A689 = 1345
20871 AE84838F80909C96 = 1254
20879 A5913080808030FFCD = 1282
20887 0451D61C47E6F020 = 900
20895 0678FE0CFAA751C9 = 1091
20903 04110D6022142580 19 = 449
20911 10FD01D602ED5B0C = 826
20919 40EBED8000000000 = 712
20927 C92A0C4011005806 = 430
20935 197EFE7628094F1A = 677
20943 7779121323 18F210 = 594
20951 FAC92A0C40001D702 = 787
20959 09D11A13D5FEFFC8 = 1185
20967 772318F506182A0C = 527
20975 40237EFE762805C6 = 840
20983 807718F510F3C9CD = 1181
20991 D951AE8385BAB980 = 1331
20999 ABAE81AA83A6B2AA = 1385
21007 80848730AFBAB3B9 = 1349
21015 8083AA8C81AE83AA = 1365
21023 8080760000000000 = 374
21031 0000000000000000 = 0
21039 0000000000000000 = 0
21047 0000000000000000 = 0
21055 000000FF080002A10 = 319
21063 407EFE4628052310 = 610
21071 F8CF1E2A0C4011F8 = 868
21079 0219360B23360BE5 = 421
21087 CD0451E1C877200A = 879
21095 77237EFE7620EE2B = 965
21103 18EBFE77200B3600 = 729
21111 2B7EFE7620DF2318 = 855
21119 DCFE7620D32A0C40 = 958
21127 11F802197EFE0B28 = 723
21135 47CDD9512A373734 = 778
21143 370E1600322E3838 = 299
21151 2E332C00363A3439 = 362
21159 2A1A00393E352A00 = 222
21167 373A330076000000 = 282
21175 0000000000000000 = 0
21183 0000000000000000 = 0
21191 0000000000000000 = 0
21199 0000000000FFCF19 = 487
21207 23E506017EFE0B28 = 702
21215 0704CB6620AB2318 = 580
21223 F32A1040237EFE48 = 850
21231 20FA23783D280B77 = 668
21239 2323011A77231310 = 494
21247 FAC936000D1C9CDD9 = 1337
21255 51AAA9AE89308284 = 1265
21263 A9AA808085B7AAB8 = 1313
21271 8880B8B984B580B9 = 1355
21279 8480AAB8A3A6B5AA = 1347
21287 80FFE12202501601 = 747
21295 1E01D5CD8A53E17E = 1069
21303 D94FD93692CD8802 = 1107
21311 444D511428F7CD8D = 927
21319 077ECB772028D947 = 815
21327 D9CD8A53E1D978D9 = 1470
21335 77D11CD5CD8A53E1 = 1268
21343 7ED94FD9CD8B022C = 1077
21351 20FA0619C506FF10 = 787
21359 FEC110F8188DD947 = 1212
21367 D9CD8A53E1D979D9 = 1471
21375 77D978D9D1FE7320 = 1283
21383 011CFE722006788FE = 812
21391 01280110DFE702006 = 475
21399 7AFE0128011 5FE71 = 806
21407 200114FEE320052A = 613
21415 0250E5C9FE772008 = 925
21423 36007BFE0128011D = 502
21431 D518A9C1D1C57BFE = 1382
21439 2020091E01147AFE = 500
21447 1620011 5D5422A0C = 409
21455 40231121001910FD = 443
21463 D1D5160019D1C1D5 = 1084
21471 E5C5C9CDD95188A8 = 1482
21479 B7B481818080B587 = 1337
21487 AA888880A6B38E80 = 1329
21495 80AABE80898430AA = 1327
21503 B8A8A6B5AA80FF21 = 1288
21511 185801F300C5E5ED = 1022
21519 580C40010602ED80 = 797
21527 CD8B022C20080119 = 504
21535 19087808120F8E101 = 842
21543 210009C108788120 = 875
21551 DCCD8B022C28D0C9 = 1107
21559 010300C5180401 02 = 232
21567 00C5CDD95188B9A6 = 1235
21575 878980B9A6B5AA9A = 1352
21583 8089ADAA83808587 = 1327
21591 AA888880A6B38E80 = 1329
21599 80AABE8080FFCD04 = 1256
21607 51C12A0050E5C921 = 859
21615 8240110050001FF04 = 551
21623 ED802A0C40110058 = 636
21631 011903ED80CD2A0A = 699
21639 060C11185BC501D6 = 562
21647 022A0C40ED8000C1 = 726
21655 10F3C92100501102 = 720
21663 40010006ED80C9CD = 890
21671 EB5111005B2A0C40 = 539
21679 011903ED80C9 = 643
```

RESPONSE FRAME

Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

VIC MEMORY

I have a Vic with 32K RAM fitted. I wish to leave the 32K in place all the time. Is this possible? Can the Vic be re-directed to accept programs which require no extension; for those programs which need 3K extra; for those which demand 8K; and for those which need 16K? I am a complete newcomer to computers and hope you can help.

C B Wood, Cheadle Hulme, Cheshire.

THIS IS RELATIVELY easy to do. You need only enter the following directly, or make it the first line of a program, and you can fool your Vic into thinking it has whatever memory you want.

Standard memory — POKE 642;16: POKE 644,30:POKE 648,30:SYS 64824
Plus 3K — POKE 642,4:POKE 644, 30:POKE 648,30:SYS 64824
Plus 8K — POKE 642,18:POKE 644, 64:POKE 648,16:SYS 64824
Plus 16K — POKE 642,18:POKE 644,96:POKE 648,16:SYS 64824
Plus 24K — POKE 642,18:POKE 644,128:POKE 648,16:SYS 64824

QL MICRODRIVE

I have bought a Microdrive for my Spectrum and am gradually transferring my programs from cassette to Microdrive. Will I be able to run these on a QL if I buy one?

Geoffrey Fraser, Dartford, Kent.

NO. THE MICRODRIVES on the QL are improved versions of the Spectrum ones, holding 100K compared with the Spectrum 85K. As well, QL SuperBasic is incompatible with Spectrum Basic.

RUN/STOP STOP

Is there any way of turning off the Run/Stop key on my Commodore 64 while a program is running? I would like you to tell me how this can be done.

G Dartin, Arbouthorne.

THERE IS A way of doing it using a Poke and a Peek, but it has the disadvantage of turning off the internal clock as well.

POKE 788,PEEK(788) + 3

will disable the Run/Stop key and

POKE 788,PEEK(788) − 3

will turn it on again.

GRAPHIC PROBLEM

I am a very interested reader of *Your Computer* magazines but I have a problem. I bought a 48K Spectrum last year and decided to type in some programs from back issues of the magazine. The ones I tried were Balloon Hopper and Star Wars. However, I don't know how I must type and what I must do to get the user graphics needed in the Basic program. Could you help me? I found these programs very attractive.

Daniel Janssens, Belgium.

THE GRAPHICS referred to, in these and similar programs, are produced by redefining a set of up to 21 letters from the Spectrum's character set. You get into graphics mode by holding down Caps Shift and pressing the Graphics key — the 9 key. Then, if the A has been redefined, you get the relevant graphic each time you pressed the A key, while in graphics mode. You can tell you are in graphics mode because the cursor becomes a G. You will find a full explanation of how to create these in your Spectrum manual, chapter 14, pages 67 to 73.

VARIABLE PEEK

I bought a Spectrum recently and would like to find out what is actually happening in its variables area. I have tried the following statements which unfortunately failed to dump all variables to the screen:

```
10 FOR X = 0 TO nn
20 PRINT CHR$(PEEK(PEEK 23627
   + 256*PEEK 23628 + X))
30 NEXT X
```

Would you please explain some way to let the program variables be revealed?

P Lee, Seven Sisters Road, London N4.

YOU HAVE ALMOST got it right. The variables begin at 23627 — so you are right about that — but the second line of your program is incorrect. To find out what is happening, where X is the address, you need to get the value

PEEK X + 256*(PEEK(N + 1))

Therefore, the state of an address, in terms of your program, can be found by changing line 20 of the program to:

```
20 PRINT PEEK (23627 + X) + 256*
   PEEK(23628 + X)
```

You also need to add Step 2 to the end of line 10.

SPECTRUM VERIFY

I own a 48K Spectrum and I have encountered a major problem when trying to include a Verify routine within a program. The routine usually prints up:"Do you wish to Verify 'name'?". If I answer Yes, the computer prints up "Rewind tape recorder and press any key", followed by a line Verify "name". I always get an R Tape loading error with the line number of the line Verify "name"! I have tried many different ways of programming such a routine and have yet to find success. Can you help?

U Schoke, Aachen-lau.

AS FAR AS I CAN determine, you are not able to use Verify within a program. It is designed to be used in the direct mode only. I cannot see why it should not work within a program, as the other tape storage commands, Load, Save and Merge, can all be accessed by calls within a program. However, I cannot make it work; you cannot make it work; the manual gives no indication that it should work; so I suppose it is not going to happen. I would be pleased to hear from anyone who has a way of doing it, so I can pass the information on.

CABLE TROUBLE?

I am considering moving house and, of course, taking my Spectrum with me. However, the new house has some overhead power cables very close to it. Would these power cables and their magnetic field have any effect on my computer? They are not national grid lines, but they do carry most of Swindon's power and are about 500 yd. from the house. I would be grateful if you could publish the answer to this rather worrying question.

P K Brown, Blunsdon, Swindon.

I HAVE NEVER heard of problems being encountered in a situation such as you describe. The only vaguely similar situation I have come across is the owner of a ZX-81 who lived next door to a CB enthusiast, who found his ability to load and save was severely restricted when the neighbour's rig was in action. Fluctuating massive power surges could pose a problem, but you are most unlikely to suffer from them in your situation. If you have any problems, which I consider extremely unlikely, you could minimise them by keeping all leads as short as possible, and perhaps using battery power on your cassette recorder.

ORIC LOADING

I have had an Oric now for three months, and have tried it with three different cassette recorders. The loading has not been reliable on any of them. Should I buy the computer-compatible cassette machine I have seen advertised?

David Hunt, Finsbury Park, N4.

FROM WHAT I have read about one such cassette recorder they do not seem significantly better than other recorders which cost about the same. Clive Gifford, author of a book on the Oric, suggests you set your volume on about 30 percent of maximum and tone around 80/90 percent. The Oric is sensitive to volume and tone changes, so this should give you a starting point. Check your cassette leads. Undo the casing of your plugs carefully, and check for a loose or poor connection. Keep the recorder heads clean, using a fluid cleaner rather than a head-cleaner tape — these tend to treat your heads harshly. Use C-15 or C-12 computer tapes, rather than ordinary audio ones, or if you must use audio ones, stick to C-60 or shorter and buy the highest quality you can afford. It is best to erase the tape before you record another program over it. Try to keep, in a safe place, a tape which always loads perfectly. If, at some time in the future, you experience a series of loading problems, you can check using your perfect tape to try and work out if it is the computer which is causing the problem. Incidentally, these suggestions apply to loading programs on most computers which use cassettes, although some are not as volume-sensitive as the Oric.

A GOOD BUY?

Having closely inspected the review of the Electron in *Your Computer* — September 1983 — I am seriously reconsidering buying the BBC Micro Model B. I am not particularly interested in interfacing the computer to anything apart from another processor sometime in the future. Is the extra £200 really worth paying?

Robert Lyle, Alva, Clacks.

MANY PEOPLE HAVE decided that buying an Electron and then upgrading it gradually so that it is, in effect, a BBC Micro is a sensible way to proceed. It will never be quite the same as a BBC Micro — no Mode 7, only a single sound channel — but for almost everything else you will probably be able to buy whatever you need to modify it.

SOUND OF MUSIC

I have recently bought myself an Oric and although I have no trouble with the built-in sound commands like Ping and Zap, I am confused about the use of Sound and Music.

Andrew Peterson, Guildford, Surrey.

THE MUSIC COMMAND is good for music, and while you can still make music with Sound, you will find this is best for sound effects. The Oric, flexible beast that it is, also has a Play command which is good for sound effects. Music is followed by four numbers, which can also be previously-assigned variables, which control channel 1, 2 or 3 — octave — 0 to 6 — note — 1 to 12 — and volume — 0 to 15. Sound is followed by three numbers which are channel — 1 to 3 as in Music for music, 4 to 6 for noise — period — the length of the note 0 to 32767 — and volume, as in Music. Play is much more complicated, with four numbers following the command: tone enable — 0 to 7 — noise enable — 0 to 7 — envelope — 1 to 7 — and period. ■

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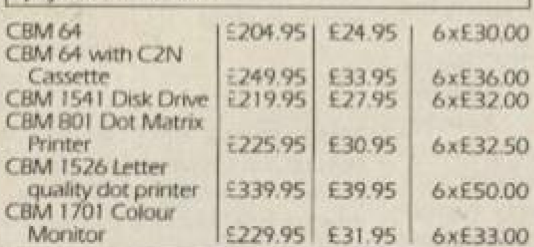
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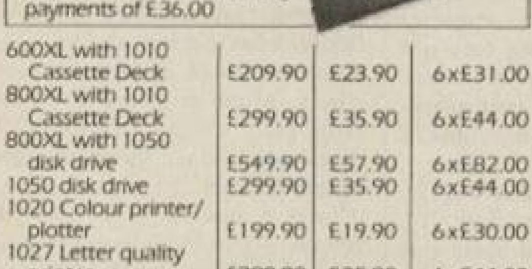
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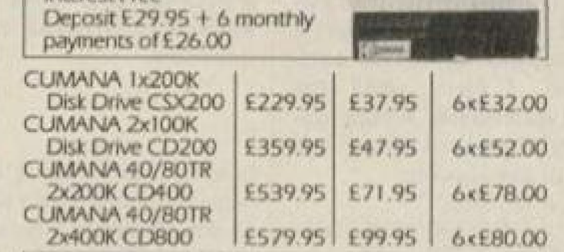
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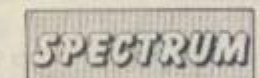
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Docking

Clyde W Bish,
Exeter,
Devon.



THIS PROGRAM MAKES use of the excellent 3D Graphics Rotation program by Mark Jones — YC July. It simulates bringing a spacecraft into visual range of a satellite using a radar screen system, then using a visual/instrument display docking with the object. The satellite is displayed as a simple cube with a cross on the front face. This could be elaborated with extra data statements — there is room purposely left above RAMtop for this — but it would slow down the graphic draw routine. In the program information which follows I have included the machine code listing in decimal as the original listing contained some errors which were corrected in subsequent issues of your magazine. The game is for the 48K machine although the 16K version of the machine code is used as space is needed to hold the screen bytes.

Type in program 1 and Run. Enter the numbers in table A. This is the machine code routine. If you already have the 16K version of the original program on tape

CLEAR 30999, LOAD "name" CODE 31000

and Run 4. You have two checks for accuracy available. Each entry is displayed on screen after it is Entered, and a check number appears at the end of the Inputs. This should be 84840. Any other number means you have made a mistake.

If all is well, press Cont and Enter. The program will now construct the sine table, and data table above RAMtop, then draw the cockpit display. When this is complete the D File bytes are loaded above RAMtop. Whilst all this is going on make yourself a cup of coffee and recover from entering umpteen machine bytes without making a mistake!

The option to Save the code then follows. Use this if you do not intend to type in the main program now. Otherwise Break and New the machine. Don't worry — your precious code is safe above RAMtop — and type in program 2. Before you try your skill as a shuttle pilot Save the whole program using

SAVE "dock" LINE 6110:SAVE "d" CODE 31000, 10144

and verify using

VERIFY " " : VERIFY " " CODE

If you have previously Saved the code Load it into the machine using.

CLEAR 30999 : LOAD " " CODE

before Saving as above.

When you Load in the program it will auto-start and Load in the code before starting the display. If you want to play having just typed it in use Run 6115.

The first display is of your craft and the satellite in orbit. You must guide your craft to superimpose the two images using the 6 key to bring it into a tighter, faster orbit, and 7 to move into a wider, slower orbit. Each move uses up 10 fuel units. The read-out of the fuel remaining and difference in the two orbits is given at bottom left of screen.

When you have superimposed the images the second part of the task begins. You are given a view of the satellite — at random attitude and position — through the viewport plus a readout of the current docking status and thruster control in operation at top left of screen, and a read-out of the control attitudes status, thrust level, and remaining fuel at bottom right.

The control keys are:

P & O = pitch to front or back
Y & T = yaw to right or left
R & E = roll to right or left
U & D = move up or down
F & B = move forward or back
M & N = move right and left

Use these to select your thruster, then press a number 1-9 to select the power of the thrust. High values are less wasteful of fuel, but you are more likely to overshoot! Cancel the thrust using the opposing thruster e.g., B cancels F. You have to get all the read-outs of control attitude status, except F-B, to 0 before moving in to dock. Your final thrust speed must be between 4 and 6 inclusive and F-B must end at 0. If all attitudes do not end 0, or you come in too fast you will crash. If you come in too slowly you will not close the docking latches, but will see the satellite bounce off. You may try again, but be careful not to run out of fuel! Pressing 0 will play again.

The capital letters in program 1, lines 6019, 6020, 6022, 6027, and program 2, lines 6020, 6040 and 6050 are user-defined graphics and should be entered in the Graphics mode.

Program 1.

```
   2 POKE 23609,50: CLEAR 30999:
 LET t=0: FOR n=31000 TO 31684:
INPUT i: LET t=t+i: POKE n,i: PR
INT n,PEEK n: NEXT n: PRINT "che
ck=";t: STOP
   4 POKE 31724,0: POKE 31725,12
8: POKE 31721,3
  10 FOR f=0 TO 180: LET c=INT (
256*SIN (2*PI*f/360))
  15 IF c=256 THEN LET c=255
  20 POKE f+31730,c: NEXT f
 100 DATA 20,-20,20,0,20,-20,-20
,1,-20,-20,-20,1,-20,-20,20,1,20
,-20,20,1,20,20,20,1,20,20,-20,1
,-20,20,-20,1,-20,20,20,1,20,20,
20,1,20,-20,-20,0,20,20,-20,1,-2
0,-20,-20,0,-20,20,-20,1,-20,-20
,20,0,-20,20,20,1
 110 DATA 0,-10,20,0,0,10,20,1,1
0,0,20,0,-10,0,20,1
1000 RESTORE 100: LET v=20
5000 FOR f=1 TO v: READ x,y,z,p
5001 IF x<0 THEN LET x=x+256
5002 IF y<0 THEN LET y=y+256
5003 IF z<0 THEN LET z=z+256
5010 POKE 31996+f*4,x: POKE 3199
7+4*f,y: POKE 31998+4*f,z: POKE
31999+4*f,p: NEXT f
5015 POKE 31699,v
6000 PAPER 0: CLS : INK 7: PLOT
0,0: DRAW 175,175,-(PI/2): FOR n
=0 TO 175: LET c=0
6005 IF POINT (c,n)=1 THEN GO TO
 6018
6010 PLOT c,n: LET c=c+1: GO TO
6005
6018 NEXT n
6019 INVERSE 1: RESTORE 6032: LE
T w=32: LET x=4: FOR n=1 TO 11:
READ a$: FOR j=0 TO 7: READ a: P
OKE USR a$+j,a: NEXT j: NEXT n
6020 FOR n=13 TO 20: PRINT AT n,
21;"D          E": NEXT n: PRINT
AT 12,21;"ABBBBBBBBBC";AT 21,21;
"FGGGGGGGGGH"
6022 INVERSE 0: PRINT AT 21,0;"I
";AT 0,31;"J";AT 11,31;"K";AT 21
,20;"K"
6026 PLOT 168,96: DRAW 0,-17: DR
AW -17,0
6027 PRINT AT 0,0; INVERSE 1;"AB
BBBBBBC";AT 1,0;"D        E";AT 2
,0;"FGGGGGGGH";AT 4,1;"ABC";AT 5
,1;"D E";AT 6,1;"FGH"
6032 DATA "a",0,0,63,w,w,w,w,w,"
b",0,0,255,0,0,0,0,0,"c",0,0,252
,4,4,4,4,4,"d",w,w,w,w,w,w,w,w,"
e",4,4,4,4,4,4,4,4,"f",w,w,w,w,w
,63,0,0,"g",0,0,0,0,0,255,0,0,"h
",4,4,4,4,4,252,0,0,"i",128,128,
128,128,128,192,224,240,"j",31,7
,3,1,1,0,0,0
6033 DATA "k",0,0,0,1,1,3,7,31
6050 FOR n=16384 TO 22528: POKE
18616+n,PEEK n: NEXT n: POKE 317
22,184: POKE 31723,136
9999 SAVE "D"CODE 31000,10144: V
ERIFY ""CODE
```

Program 2.

```
   1 IF v<0 THEN LET v=v+65536
   2 LET a=INT (v/256): LET b=IN
T (256*(v/256-a)): POKE d,b: POK
E d+1,a: LET d=d+2: RETURN
   3 POKE 31725,125: POKE 23658,
8
   4 BORDER 7: FOR f=1 TO 2: PAP
ER 0: CLS : INK 7: NEXT f: LET t
h=0: LET c$="DOCKING": LET b$="
": LET t=0
   5 LET px=INT (RND*10+10): LET
 py=INT (RND*40+40): LET pz=INT
(RND*50+50)
   7 LET phi=INT (RND*360): LET
psi=INT (RND*360): LET theta=INT
 (RND*360)
2000 LET a$=INKEY$: IF a$="" THE
N LET a$=b$
2001 IF t>0 THEN LET th=INT (th+
9*1/t): LET fu=INT (fu-9*1/t)
2002 IF a$>="0" AND a$<="9" THEN
 LET t=VAL a$: LET fu=fu-t: LET
a$=b$
2005 IF a$="U" AND b$="D" OR a$=
"D" AND b$="U" OR a$="M" AND b$=
"N" OR a$="N" AND b$="M" OR a$="
F" AND b$="B" OR a$="B" AND b$="
F" OR a$="P" AND b$="O" OR a$="O
" AND b$="P" OR a$="Y" AND b$="T
" OR a$="T" AND b$="Y" OR a$="R"
 AND b$="E" OR a$="E" AND b$="R"
 THEN LET fu=fu-th: LET th=0: LE
T t=0
2010 LET b$=a$: LET px=px+t*(a$=
"N")-t*(a$="M")
2020 LET py=py+t*(a$="U")-t*(a$=
"D")
2030 LET pz=pz+t*(a$="B")-t*(a$=
"F")
2040 LET theta=theta+t*(a$="T")-
t*(a$="Y")
2050 LET psi=psi+t*(a$="R")-t*(a
$="E")
2060 LET phi=phi+t*(a$="O")-t*(a
$="P")
2080 IF theta>=360 THEN LET thet
a=theta-360
2090 IF psi>=360 THEN LET psi=ps
i-360
3000 IF phi>=360 THEN LET phi=ph
i-360
3010 IF theta<0 THEN LET theta=t
heta+360
3020 IF phi<0 THEN LET phi=phi+3
60
3030 IF psi<0 THEN LET psi=psi+3
60
3040 IF pz>256 THEN LET pz=256
3050 LET v=px: LET d=31706: GO S
UB 1: LET v=py: GO SUB 1: LET v=
pz: GO SUB 1
3052 LET d=31712: LET v=phi: GO
SUB 1: LET v=theta: GO SUB 1: LE
T v=psi: GO SUB 1
3054 RANDOMIZE USR 31536
3056 PRINT AT 1,1;c$;AT 5,2; INV
ERSE 1;a$;AT 13,22;"L-R  ";px+19
;AT 14,22;"U-D  ";py-83;AT 15,22
;"F-B  ";pz+109;AT 16,22;"Pitch"
;phi-180;AT 17,22;"Yaw   ";theta;
AT 18,22;"Roll  ";psi;AT 19,22;"T
hrust  ";t;AT 20,22;"Fuel  ";fu:
IF C$="NO DOCK" THEN RETURN
3060 IF fu<1 THEN LET c$="NO FUE
L": GO TO 5000
3065 LET P=0: IF phi=180 AND psi
=0 AND theta=0 AND px=-19 AND py
=83 THEN LET p=1
3070 IF pz<-109 OR pz=-109 AND p
<>1 OR pz=-109 AND p=1 AND t>6 T
HEN LET c$="CRASHED": GO TO 5000
3080 IF PZ=-109 AND P=1 AND T<7
AND T>3 THEN LET C$="DOCKED ": G
O TO 5000
3090 IF PZ=-109 AND P=1 AND T<4
THEN LET C$="NO DOCK": LET R=INT
 (RND*10+1): FOR N=1 TO RND*5+5:
 LET pz=pz+r*2: LET theta=theta-
r: LET psi=psi-r*2: LET phi=phi+
r: GO SUB 2050: NEXT n: GO TO 50
00
3099 GO TO 2000
5010 PRINT AT 1,1; FLASH 1;c$: I
F C$="NO DOCK" THEN LET c$="DOCK
ING": LET B$=" ": GO TO 2000
5020 GO TO 9000
6000 BORDER 1: PAPER 7: CLS : IN
K 0: LET fu=999: LET r1=INT (RND
*5)+3: LET r2=INT (RND*6)+3: LET
 a1=0: LET a2=PI: LET h=0
6010 PRINT AT 19,0; INK 1;"
";AT 20,0; INK 0;"Fuel  "
;fu; INK 1;" ";AT 21,0; INK 0;"O
rb.Diff ";ABS (r1-r2); INK 1;" "
6020 LET a1=a1+(PI/2)/r1: LET a2
=a2+(PI/2)/r2: LET c=COS a1: LET
 s=SIN a1: LET x1=INT (r1*c+16.5
): LET x2=INT (r2*COS a2+16.5):
LET y1=INT (r1*s+10.5): LET y2=I
NT (r2*SIN a2+10.5): LET a$=("A"
 AND s<=-.921)+("B" AND s>-.921
AND s<=-.382 AND c>0)+("C" AND c
>=.924)+("D" AND s>.382 AND s<.9
21 AND c>0)+("E" AND s>.921)+("F
" AND s<.921 AND s>-.382 AND c<0
)+("G" AND c<=-.924)+("H" AND s<
-.382 AND s>-.921 AND c<0): IF h
=0 THEN GO TO 6040
6030 PRINT AT y8,x8;" ": PRINT A
T y9,x9;" "
6040 PRINT AT 10,16;"J": PRINT A
```

(continued on page 173)

(continued from page 171)

```
T y1,x1;a$: IF x1=x2 AND y1=y2 T
HEN GO TO 6100
6050 PRINT AT y2,x2;"I": IF INKE
Y$="6" THEN LET r1=r1-1: LET fu=
fu-10
6060 IF INKEY$="7" THEN LET r1=r
1+1: LET fu=fu-10
6070 PRINT AT 21,9;ABS (r1-r2);A
T 22,5+(fu<100);" ";fu: LET y0=y
1: LET x0=x1: LET y9=y2: LET x9=
x2: IF r1>10 THEN LET r1=10
6075 IF fu=0 THEN PRINT AT 10,12
; BRIGHT 1; FLASH 1;"NO FUEL": G
O TO 9000
6080 IF r1<1 THEN LET r1=1
6090 LET h=h+1: GO TO 6020
6100 PRINT AT y1,x1;a$;AT y1,x1;
 OVER 1;"I": PRINT AT 0,3; FLASH
 1; BRIGHT 1;"SATELLITE IN VISUA
L RANGE": FOR N=1 TO 500: NEXT N
: GO TO 3
6110 CLEAR 30999: LOAD ""CODE
6115 RESTORE 6115: FOR n=USR "r"
 TO USR "j"+7: READ a: POKE n,a:
 NEXT n: GO TO 6000: DATA 0,252,
254,103,103,254,252,0,24,28,252,
230,103,63,31,14,102,126,126,102
,102,126,60,24,12,28,63,103,230,
252,248,112,0,63,127,230,230,127
,63,0,112,248,252,230,103,63,28,
12,24,60,126,102,102,126,126,102
,14,31,63,103,230,252,56,48,0,0,
0,24,24,0,0,0,0,60,126,126,126,1
26,60,0
9000 PRINT #0;"PRESS 0 TO PLAY A
GAIN": PAUSE 0: IF INKEY$<>"0" T
HEN GO TO 9000
9010 GO TO 6000
```

Table A.

```
62 128 50 232 123 17 0 1
42 216 123 205 85 121 34 216
123 34 230 123 175 50 232 123
17 0 0 42 212 123 235 205
85 121 17 128 0 205 178 121
34 212 123 17 87 0 42 214
123 213 205 85 121 209 205 178
121 34 214 123 201 175 235 237
82 203 124 196 194 121 68 77
58 232 123 143 56 4 237 75
230 123 229 197 235 33 0 0
205 156 121 48 22 175 225 209
188 32 1 235 205 147 121 68
77 33 0 0 205 156 121 205
147 121 201 6 8 205 149 121
209 209 201 6 4 203 60 203
29 16 250 201 203 56 203 25
48 2 25 216 40 6 235 41
216 235 24 240 120 254 0 200
24 244 235 58 232 123 203 63
48 5 25 50 232 123 201 237
82 201 213 235 175 103 111 237
82 58 232 123 60 50 232 123
209 201 31 48 15 1 90 0
9 229 1 104 1 237 66 56
2 193 229 225 229 175 1 180
0 237 66 56 4 62 1 193
229 225 50 232 123 1 242 123
9 78 6 0 237 67 230 123
235 205 89 121 201 197 229 245
205 210 121 58 232 123 31 220
194 121 241 60 209 193 245 229
235 80 89 205 210 121 58 232
123 31 220 194 121 209 241 31
48 2 25 201 235 237 82 201
42 226 123 237 91 212 123 237
75 216 123 229 213 197 62 1
205 5 122 34 212 123 193 209
225 175 205 5 122 229 193 42
224 123 237 91 214 123 229 213
197 175 205 5 122 34 216 123
193 209 225 62 1 205 5 122
229 193 42 228 123 237 91 212
123 229 213 197 62 1 205 5
122 34 212 123 193 209 225 175
205 5 122 34 214 123 201 42
212 123 237 91 238 123 14 1
175 237 82 203 124 40 6 38
0 149 111 13 13 69 197 42
214 123 237 91 240 123 6 1
175 237 82 203 124 40 4 149
111 5 5 209 74 80 69 217
229 217 121 184 48 6 105 213
175 95 24 8 177 40 59 104
65 213 22 0 96 120 31 133
56 3 188 56 7 148 79 217
193 197 24 4 79 213 217 193
42 240 123 121 72 5 40 1
4 9 34 240 123 42 238 123
79 71 5 40 1 4 9 34
238 123 205 6 123 217 121 16
206 209 217 225 217 201 175 42
238 123 188 192 77 42 240 123
188 192 62 175 149 216 71 205
177 34 71 4 62 1 15 16
253 70 253 203 87 94 40 4
47 160 119 201 176 119 201 58
233 123 31 48 25 31 1 0
24 17 0 64 48 7 42 234
123 237 176 24 9 33 203 36
43 237 160 234 72 123 237 75
210 123 42 236 123 197 175 87
94 203 123 40 1 21 237 83
212 123 87 35 94 203 123 40
1 21 237 83 214 123 87 35
94 203 123 40 1 21 237 83
216 123 35 229 205 48 122 237
91 218 123 42 212 123 41 25
34 212 123 237 91 220 123 42
214 123 41 25 34 214 123 237
91 222 123 42 216 123 25 34
216 123 205 24 121 225 126 35
229 31 56 17 42 212 123 34
238 123 42 214 123 34 240 123
205 6 123 24 3 205 135 122
225 193 16 145 201 0 0 0

CHECK = 84840
```

Guitar Player

Richard Adams,
Milton Keynes,
Buckinghamshire.

CBM-64

When the program is run the computer reads data in for the chord shapes on a guitar. Then you will be shown the frets of a guitar on the screen. By pressing the letter C on the keyboard the computer will play the chord of C using the same notes as a guitar and will also print the chord shape on to the screen.

This program will work with seventh and minor chords and also sharps. Instructions appear on the screen also. Here is a description of the program.

20 to 140	contain the main program. This is at the start in order to make the program run as fast as possible.
20	looks at locations 197 and 653 which tell the computer which chord to play and whether it is a sharp, seventh or minor.
50	N$ contains the chord shape.
70	Waveform — sawtooth.
80 to 90	Takes each note and Pokes it into the sound registers.
110	Pokes chord shape onto screen.
130	Clears waveform and sound registers.
150	Defines variables. I have put the most used variables first so they will be at the top of the variables table in memory — this speeds up the program by about 20 percent.
160	Clears all sound registers.
170	Sets volume and attack and decay.
190	Sets screen colours — Black on Black.
200	Sets character colour — Light grey.
220-240	Reads chord shapes and data to Poke into sound registers for each chord.
250-270	Instructions.
280-320	Prints frets on to screen.
1000-1078	Data for chord shapes.
1080-1130	Data for sound registers.

```
10 GOSUB150
20 P1=PEEK(197)-10:P2=PEEK(653)
30 IFP1>18THEN20
40 IFP2>3THENP2=P2-A
50 N$=V$(P2,P1)
60 PRINT"■■■":FORI=Z"07:PRINT"■■++■++■++■++■■+":NEXT
70 POKES+4,SO
80 FORI=ATOLEN(N$):N=VAL(MID$(N$,I,A))
90 POKES+A,CH(I-A,N):POKES,CL(I-A,N)
100 IFN=ZTHEN120
110 X=L*N*B+I*B-A:POKECO+X,BC:POKESC+X,BA
120 NEXT
130 POKES+4,SZ :POKES,Z:POKES1,Z
140 GOTO20
150 I=0:J=0:Z=0:A=1:SC=1064:CO=55336:B=2:L=40:BA=81:BC=5:SZ=32:SO=33:P1=0:P2=0
160 S=54272:FORI=STOS+24:POKEI,0:NEXT
170 POKES+24,15:POKES+5,SZ-1
180 DIMN(6),V$(6,18),CH(5,8),CL(5,8)
190 POKE53280,0:POKE53281,0
200 POKE646,15
210 PRINT"J"
220 FORI=ZTO6:READN(I)
230 FORJ=ZTO5:READV$(J,N(I)):NEXT:NEXT
240 FORI=ZTO5:FORJ=ZTO8:READCH(I,J),CL(I,J):NEXTJ,I
250 PRINTTAB(13)"■■■■■■■■'SHIFT' GIVES SEVEN CHORDS
260 PRINT:PRINTTAB(13)"'CTRL'  GIVES SHARP CHORDS
270 PRINT:PRINTTAB(13)"'CBM'   GIVES MINOR CHORDS
280 PRINT"■■ E A D G B E■"
290 PRINT" ┌┬┬┬┬┬┐
300 FORI=1TO10:PRINT"|■| ,J | | | |■|"
310 PRINT" ├┼┼┼┼┼┤"
320 NEXT
330 RETURN
1000 DATA10,332010,032310,335543
1010 DATA446664,446464,446654
1020 DATA8,200232,200212,100231
1030 DATA668886,668686,668876
1040 DATA4,022100,020130,022000
1045 DATA022100,020130,022000
1050 DATA11,133211,131211,133111
1060 DATA244322,242322,244222
1070 DATA16,320003,320001,355333
1072 DATA466544,464544,466444
1074 DATA0,002220,002020,002210
```

(continued on next page)

(continued from previous page)

```
1076 DATA688766,686766,688666
1077 DATA18,224442,224242,224432
1078 DATA335553,335353,335543
1080 DATA5,71,5,152,5,237,6,71,6,167,7,12,7,119,7,233,8,97
1090 DATA7,12,7,119,7,233,8,97,8,225,9,104,9,247,10,143,11,48
1100 DATA9,104,9,247,10,143,11,48,11,218,12,143,13,78,14,24,14,239
1110 DATA12,143,13,78,14,24,14,239,15,210,16,195,17,195,18,209,19,239
1120 DATA15,210,16,195,17,195,18,209,19,239,21,31,22,96,23,181,25,30
1130 DATA21,31,22,96,23,181,25,30,26,156,28,49,29,223,31,165,33,135
```

3D Oxo

*A J Heathcote,
Canterbury,
Kent.*



3D Oxo is a three-dimensional adaptation of noughts and crosses. This program is written in machine code for a 16K ZX-81.

The board displayed on the screen is a representation of a 4 by 4 cube. The aim of the game is to complete a line of four crosses — in any direction — before the computer gets a line of four noughts. The player may select one of three levels of skill; level 1 is the easiest. The machine code is stored in a Rem statement in Line 1. To create this line, type: 1 Rem, followed by 133 characters.

If the line has been correctly entered, then Peek 16647 = 118. By editing the line number, enter a total of 12 Rem statements — lines 1-12 — of the same length. Check that Peek 18176 = 118, then:

```
POKE 16511, 128
POKE 16512, 6
```

Line 1 is now one long Rem statement containing 1,662 characters. The machine code occupies 1,528 of these addresses; the remaining addresses are used by the computer as a workspace.

Type in the hex loader program — figure 1. Run the program, and enter the machine code, line by line, as shown in figure 2. Save the program on a cassette, then overwrite lines 10-40 as follows:

```
10 RAND USR 17831
20 STOP
30 SAVE "3D OXO"
40 RUN
```

Delete lines 50-250, and then run the program. If the code has been entered correctly, you will be asked first to choose your level of play and then to decide who starts. At the beginning of each move, a cursor appears at the top left-hand corner of the board. The keys 5 to 8 are used to move the cursor. Shift 6 and Shift 7 will move the cursor to a different level — down and up respectively.

Move the cursor to the square of your choice, then press Newline to enter an X. The computer makes its move in the same way, entering a 0 in one of the squares. To stop the game, enter S instead of making your move.

A complete line of noughts or crosses is indicated by a row of flashing squares. If no result is possible, the computer declares a draw.

When you are satisfied that the program is running smoothly, save it again, using the command Run 30.

A copy of this program is available on a cassette, price £3, from A J Heathcote, 11 Norman Road, Canterbury, Kent CT1 3LX.

Figure 1.

```
 10 REM HEX LOADER
 20 PRINT "START ADDRESS"
 30 INPUT A
 40 LET A$=""
 50 FOR N=A TO 18034 STEP 8
 60 SCROLL
 70 LET S=0
 80 PRINT AT 18,0;N;"  ";
 90 INPUT A$
100 IF A$="S" THEN STOP
110 IF LEN A$<>16 THEN GOTO 220
120 PRINT A$;" = ";
130 INPUT T
140 PRINT T
150 FOR K=0 TO 7
160 LET C=16*CODE A$+CODE A$(2)
-476
170 LET S=S+C
180 POKE N+K,C
190 LET A$=A$(3 TO )
200 NEXT K
210 IF S=T THEN GOTO 240
220 PRINT AT 18,7;"PLEASE ENTER
AGAIN        "
230 GOTO 70
240 NEXT N
250 STOP
```

Figure 2.

```
16514   3E343A3700323436 = 386
16522   2A00323E00323436 = 315
16530   2A00173E343A003C = 297
16538   2E331717002E003C = 249
16546   2E33001700263334 = 261
16554   392D2A370000002C = 243
16562   26322A0F0000BCAD = 506
16570   B480B8B9A6B7B9B8 = 1395
16578   0F00103E18321117 = 207
16586   26002937263C1700 = 255
16594   011504130D0D100B = 98
16602   0105110521053105 = 120
16610   0403140324033403 = 124
16618   0111051109110D11 = 96
16626   040F080F0C0F100F = 100
16634   0114021403140414 = 90
16642   0D0C0E0C0F0C100C = 106
16650   0101050109010D01 = 32
16658   1101150119011D01 = 96
16666   2101250129012D01 = 160
16674   3101350139013D01 = 224
16682   0104020403040404 = 26
16690   1104120413041404 = 90
16698   2104220423042404 = 154
16706   3104320433043404 = 218
16714   0110021003100410 = 74
16722   0510061007100810 = 90
16730   09100A100B100C10 = 106
16738   0D100E100F101010 = 122
16746   FFC5CDF50806093E = 987
16754   16D710FDC1040DC9 = 917
16762   CD7D41CD8041C5CD = 1195
16770   F5083E18D706043E = 626
16778   18D73E18D710F8C1 = 1000
16786   040DC9FD3622001E = 589
16794   0406000E09D5CD6B = 558
16802   41CD7A41CD6B41D1 = 1043
16810   1D20F0C9CDB8022C = 940
16818   20FACDB802444D2C = 865
16826   28F8CDBD077EC901 = 1017
16834   00400BCB7828FBC9 = 890
16842   01140BD5CDF508D1 = 912
16850   010900C36B0B21C0 = 545
16858   46AF327F46064077 = 681
16866   2310FCC9ED4B3C40 = 940
16874   FD563EC9CDE64179 = 1223
16882   8790C6094F7A6782 = 952
16890   87803C47C3F508CD = 1047
16898   EE41CBFEE5CDAE41 = 1433
16906   E1CB8EFE76283FFE = 1347
16914   382833E5213E40FE = 789
16922   702007AFBE282135 = 642
16930   1821FE7120083E03 = 529
16938   BE281534181528FE = 645
16946   2328E8FE2228EF2B = 917
16954   FE2128DFFE2428E6 = 1110
16962   E118BFE118B9CDBB = 1266
16970   022C20FACF08CB6E = 856
16978   20B03634CDE64121 = 847
16986   80467A8737808787 = 988
16994   8116005F193634C9 = 578
17002   116046A7ED527D16 = 848
17010   FF14D61030FBC610 = 1018
17018   06FF04D60430FBC6 = 980
17026   044FC97BA7C834C5 = 1023
17034   E5D5CDEE41CBFECD = 1612
17042   C141CBBED1E1C17B = 1401
17050   BEC83418EACD6A42 = 1077
17058   CDB84259CD842558 = 1040
17066   23CD85425A23CD85 = 902
17074   422A0E40363D213E = 396
17082   40AF772B772B77C9 = 883
17090   4E235EAF4757217F = 700
17098   46094F06043A2140 = 323
17106   BE2004CBC11816AF = 843
17114   BE2010CB512808CB = 773
```

(continued on page 177)



The famous Panda Expandable RAM pack for the ZX81. Massive 16K add-on memory which can easily be expanded to a GIANT 32K with an optional plug-in MODULE. Rugged no-wobble design injection moulded case with integral LED power on indicator. No additional power supply needed, just plug on and go. British designed and built. Thousands in use. Prices: PANDA 16K **£19.95**. MODULE **£14.50**. GIANT 32K **£34.00**.

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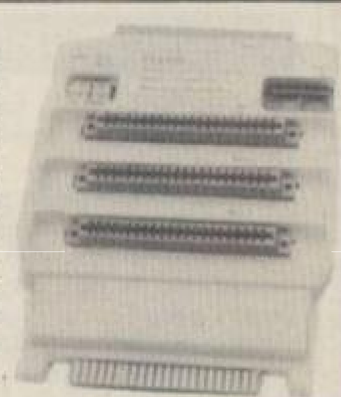
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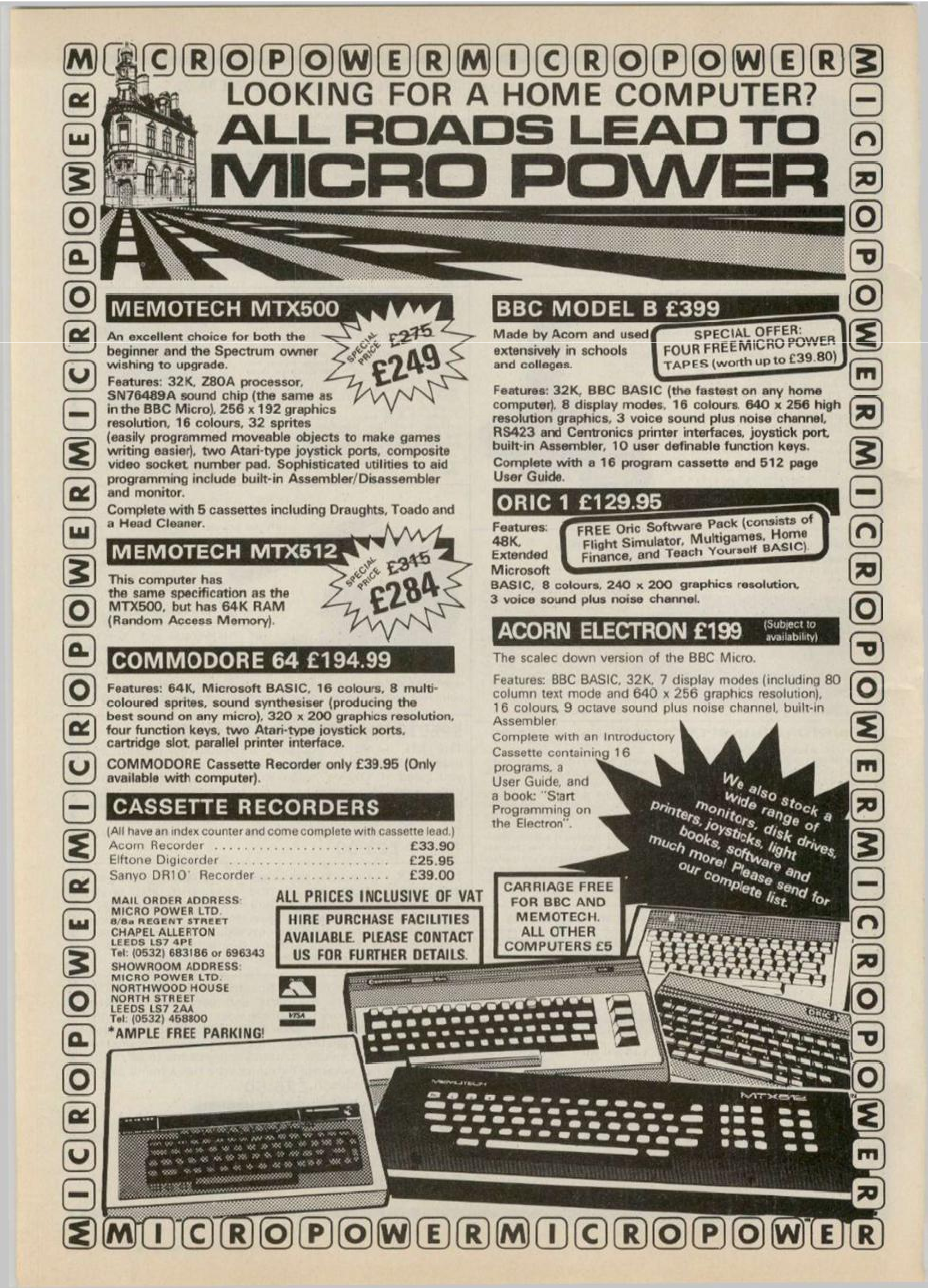
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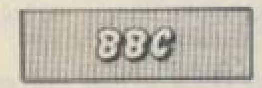

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(continued from page 174)

```
17122   592802CBE1CBD9CB = 1182
17130   D11802CBC91910DD = 901
17138   C90604AFED52BE28 = 935
17146   0210F6363DC39F42 = 801
17154   CDD84121D2407EFE = 1173
17162   FF281FE5CDC2423E = 1082
17170   05B92006CDF342E1 = 967
17178   18233CB9200722C0 = 569
17186   46ED53C246E12323 = 949
17194   18DC3AC146A7C82A = 974
17202   C046ED5BC246CDF3 = 1302
17210   42C1C3304621D240 = 879
17218   7EFEFFC8E5CDC242 = 1529
17226   3E02893005E12323 = 597
17234   18EEC1A7ED52E5ED = 1407
17242   52CD6A42CDF141E5 = 1205
17250   E1D5CD6A42CDF141 = 1326
17258   D1E5A7ED52EBE14E = 1462
17266   060679CBFF180BA7 = 793
17274   77ED5277ED5277ED = 1232
17282   5277C50100020CDC4 = 832
17290   41C1CB7E28E97119 = 998
17298   7119711971 10EB11 = 657
17306   94403E34BE28021E = 588
17314   9DC1CDCA4111A640 = 1069
17322   01140DCDCD4111AF = 701
17330   4001140ECDCD41CD = 779
17338   AE41FE33CA4842FE = 1138
17346   3E20F4C3A445CDD8 = 1187
17354   4121D2407EFEFFC8 = 1207
17362   E5CDC2423E0DB920 = 986
17370   290604A7ED52E57E = 892
17378   A7201CD5117F46D5 = 867
17386   ED52EB7EA721C046 = 1142
17394   2809577EBB281023 = 540
17402   1520F873E134D1E1 = 1127
17410   10D9E1232318C5D1 = 958
17418   D1E1D1363DCD9F42 = 1188
17426   E1C33046CDC8433A = 1068
17434   7F46A7C821D2407E = 997
17442   FEFFC8E5CDC2423E = 1465
17450   1DB92029060 40E02 = 313
17458   A7ED52E57EA7201A = 1066
17466   D5117F46ED52EB56 = 1067
17474   21C0467EBB20060D = 659
17482   2810327B40231520 = 381
17490   F2D1E110DBE12323 = 1206
17498   18C5D1E1E1217B40 = 1100
17506   5E2D2600C3E044CD = 885
17514   D84121D2407EFEFF = 1223
17522   2838E5CDC2423E03 = 855
17530   A1FE032828A72802 = 707
17538   3E013C00CB612002 = 457
17546   C6044F0604AFED52 = 785
17554   BE2010E5D5118046 = 895
17562   ED5211C046197E81 = 878
17570   77D1E110E8E12323 = 1096
17578   18C30640AF0E0021 = 511
17586   C046BE20010C3003 = 548
17594   7E0E012310F4A728 = 643
17602   2457413A34409030 = 554
17610   FD803C4F06407A2B = 755
17618   BE20030D280210F7 = 543
17626   A711C046ED521180 = 910
17634   4619C30D4411C940 = 653
17642   C3A3430000000808 = 441
17650   0000080808000000 = 24
17658   0000080800000800 = 24
17666   0000080000080800 = 24
17674   0000000000000000 = 0
17682   0800080000080000 = 24
17690   0008000000800008 = 24
17698   0008000000800008 = 24
17706   0000000000000008 = 8
17714   0800080000080000 = 24
17722   0008000000800000 = 16
17730   0800000000800008 = 24
17738   000000002834353E = 207
17746   372E2C2D390E0025 = 299
17754   002F002D2A26392D = 274
17762   2834392A1A001D25 = 283
17770   242000001200 0CD6B = 413
17778   06C90620D710FDC9 = 935
17786   FD362200010000CD = 547
17794   F50806180E20AFD7 = 719
17802   0D20FC3E76D710F4 = 952
17810   C9BCADA6B980B1AA = 1388
17818   BBAAB10F00101D16 = 616
17826   1F11CD7A45010000 = 445
17834   CDF5083E09CD7445 = 919
17842   3E17CD74453E76D7 = 870
17850   D711ED4401600 0CD = 839
17858   6B0B110D45CD6D45 = 600
17866   11ED44CD6D453E76 = 885
17874   D7D73E17CD74453E = 967
17882   09CD74453E76D7D7 = 1009
17890   114D45CD6D450101 = 548
17898   12C5CDF508011100 = 691
17906   119345CD6B0BCDAE = 935
17914   41FE1D38F9FE2030 = 987
17922   F5327C40C1CDF508 = 1134
17930   01110011B840CD6B = 595
17938   0BCDAE41FE322805 = 804
17946   FE3E20F5AFF5CD7A = 1340
17954   45218046CDD841CD = 994
17962   9541F1A7280CCD88 = 1063
17970   42118240CDCA41CD = 954
17978   0142118B40CDCA41 = 759
17986   FD36213DCD3F43CD = 941
17994   02433A7C40FE1D28 = 638
18002   1FCDC843FD362134 = 895
18010   CDC8433A7C40FE1E = 1002
18018   280EFD36213DCD15 = 682
18026   44FD362134CD1644 = 755
18034   FD36213DCD6944C9 = 980
```

Race Chase

Martin Blackburn,
Brighouse,
West Yorkshire.



RACE CHASE makes full use of the BBC's colour and sound facilities. It is by no means easy, and needs skill and quick reactions.

The game starts by displaying a title screen complete with instructions. After a key is pressed the nine high scores are displayed. The introduction tune, taken from the television series Grand Prix, is played. Next, upon pressing another key the maze is crawn. It then changes colour, and when a colour scheme that you want appears, press a key to retain it.

Both cars will appear; the car that you control is the one on the left. A further key is now pressed, upon which the high score appears in the middle of the maze, complete with the person's name.

Your score and bonus appear at the top of the screen and the game starts. When a dot has been run over the computer emits a short note, and the score increases by 10 points. Your car can be moved in or out one lane only by pressing key I or D respectively at the appropriate moment.

The object of the game is to clear the maze

(continued on page 179)

```
140 *FX14,6
150A1$=CHR$(129):A2$=CHR$(130):A3$=CHR$(131):A4$=CHR
$(132):A5$=CHR$(133):A6$=CHR$(134)
160*KEY 10 O.|M|NL.|M
170DATA121,20,121,5,129,5,133,10,129,5,121,5,113,5,1
21,5,129,10,101,20
180DIMA$(4),P(4),Q(4),R(4),S(4)
190SC=0:T=5000
200MODE7:FORA=1TO2:PRINTA4$;CHR$(157);CHR$(141);A1$"
         RACE-CHASE":NEXT
210FORA=23TO24:PRINTTAB(0,A);A4$;CHR$(157);A1$;CHR$(
141);"COPYRIGHT M.Blackburn MARCH 1984";:NEXT
220PRINTTAB(0,5);A2$;"The object of the game is to d
rive     ";A2$;"around the maze, collecting the dots
 ";A2$;"& avoiding the drongo driver in the     ";A2$;"
other car"
230PRINTA6$;"There are 2 phases in the game, the
";A6$;"second of which is twice as fast as the";A6$;"f
irst."
240PRINT;A5$;"Press 'I' to move in a lane, & 'O' to
 ";A5$;"move out a lane"
250*FX21,0
260PRINT:PRINT:FORA=1TO2:PRINT;A2$;CHR$(141);"HIT A
KEY":NEXT
270A=GET
280CLS
290DIMS$(10),Z(10)
300FORB=1TO9:S$(B)="Barnaby soft":Z(B)=(300*(10-B)):
NEXT
310FORA=1TO2:PRINT;A4$;CHR$(157);CHR$(141);A1$;"
```

(listing continued on page 179)

(continued from page 177)

of all the dots in the fastest possible time, and at the same time avoiding the Drongo Driver in the other car. The longer you take the lower your score will be as the bonus is constantly decreasing.

If the first maze is completed successfully the screen will be cleared, and the maze will be drawn again. A key will then have to be pressed quickly if the same colour scheme is required. Upon pressing another key the second phase will start, but watch out, it is twice as fast as the first.

When the first maze has been completed your score will consist of the points scored for running over the dots, plus the remainder of your bonus. On starting the second phase the bonus is reset to 5,000 points.

If a sheet is not completed then no bonus is added to your score. When you are killed, if you achieve a high score then you will be asked for your name — characters only. If your score was not high enough then you will be informed; either way hitting a key restarts the game.

The Escape key has been disabled so that the high scores cannot be lost if this key is pressed. The only way to stop the game is by pressing the Break key.

Finally, if you have not got the time to copy in the program, or you are not very good at typing, then send a blank cassette along with a stamped addressed envelope, and £1.50 to the following address: Martin Blackburn, 15 Long Ridge, Rastrick, Brighouse, West Yorkshire HD6 3RZ.

(listing continued from page 177)

```
RACE-CHASE HI-SCORES":NEXT
320FORB=1TO9:PRINT'"     ";A3$;B;" ";A1$;S$(B);STRING$
((25-LENS$(B)),".");A5$;Z(B):NEXTB
330*FX21,0
340RESTORE:PRINT:FORA=1TO2:PRINT;A4$+CHR$(157);CHR$(
141);A1$;"              HIT A KEY":NEXT:FORA=1TO10:READC
,D:SOUND1,-15,C-48,D-1:SOUND1,0,0,0:NEXT:A=GET
350ENVELOPE1,1,0,0,0,0,0,0,126,-1,-1,-100,126,125
360 MODE1
370S=2
380VDU24,0;0;1240;983;
390GCOL0,129:GCOL0,3:CLG
400COLOUR129
410 VDU23,255,0,0,0,0,48,48,0,0
420VDU23,251,14,238,69,255,255,69,238,14
430VDU23,252,90,126,90,24,219,255,219,60
440VDU23,253,112,119,162,255,255,162,119,112
450VDU23,254,60,219,255,219,24,90,126,90
460 FORA=12TO440STEP64
470 MOVEA,A-4
480 DRAWA,983-A
490 DRAW1243-A,983-A
500 DRAW1243-A,A-4
510 DRAWA,A-4
520 NEXTA
530COLOUR2
540 FORA=1TO37STEP2
550 FORB=2TO31STEP2
560 PRINTTAB(A,B);CHR$(255);
570 NEXTB,A
580 FORA=2TO12
590 PRINTTAB(18,A);"    "
600 PRINTTAB(18,A+18);"    "
610 NEXT
620 FORA=15TO17
630 PRINTTAB(1,A);"            "
640 PRINTTAB(27,A);"            "
650 NEXT
660FORA=14TO18:PRINTTAB(13,A);"               ":NEXT
670PRINTTAB(15,16)"HIT A KEY"
680*FX21,0
690D=INKEY(100):IFD>0THEN760
700A=RND(5)-1:B=RND(8)-1:C=RND(8)-1
710IFA=B OR A=C THEN700
720VDU19,1,A,0,0,0
730VDU19,3,B,0,0,0
740VDU19,2,C,0,0,0
750GOTO690
760DATA-16,-16,0,-12,0,12,16,16,16,48,0,-12,0,12,-16
,-48
770RESTORE760:FORA=1TO4
780READP(A),R(A),Q(A),S(A):A$(A)=CHR$(250+A):NEXT
790X=540:Y=56:E=1:L=1:D=0:G=668:H=120:M=2:F=3:Z=0
800VDU5
810VDU18,3,2,25,4,G-P(F)*S;H-Q(F)*S;250+F
820VDU18,3,2,25,4,X-P(E)*S;Y-Q(E)*S;250+E
830VDU4
840A=GET
850PRINTTAB(0,0);"  SCORE                        BONUS
   "
860PRINTTAB(13,15);"HI SCORE ";Z(1):PRINTTAB(15,16);
"   BY    ";TAB(13,17);S$(1);STRING$(13-LENS$(1),"."):
VDU5
870*FX11,9
880*FX12,2
890VDU18,3,2,25,4,X-P(E)*S;Y-Q(E)*S;250+E:B=INKEY(1)
:*FX21,0
900IFPOINT(X+R(E),Y+S(E))=3THENE=E+1:IFE=5THENE=1
910IFPOINT(X+16,Y-16)=2THEND=D+1:SC=SC+10:SOUND1,-15
,(D MOD 2)*4,1
920IFD=240THEN1100
930VDU4:PRINTTAB(8,0);SC;TAB(32,0);T:VDU5
940IFB<>73THEN960ELSEIFX>584ANDX<624ANDL<6THENY=Y-P(
E)*4:L=L+1
950IFY>472ANDY<512ANDL<6THENX=X+Q(E)*4:L=L+1
960IFB<>79THEN980ELSEIFY>472ANDY<512ANDL>1THENX=X-Q(
E)*4:L=L-1
970IFX>584ANDX<624ANDL>1THENY=Y+P(E)*4:L=L-1
980VDU18,0,3,25,4,X;Y;250+E
990X=X+P(E)*S:Y=Y+Q(E)*S
1000VDU18,3,2,25,4,G-P(F)*S;H-Q(F)*S;250+F
1010 IFPOINT(G+R(F),H+S(F))=3THENF=F-1:IFF=0THENF=4
1020IFL<=M THEN1040ELSEIFG>584ANDG<624THENH=H+P(F)*4:
M=M+1
1030IFH>464ANDH<520THENG=G-Q(F)*4:M=M+1
1040IFL>=M THEN1060ELSEIFH>464ANDH<520THENG=G+Q(F)*4:
M=M-1
1050IFG>584ANDG<624THENH=H-P(F)*4:M=M-1
1060VDU18,3,2,25,4,G;H;250+F
1070IFABS(G-X)<40ANDABS(H-Y)<40THEN1220
1080G=G+P(F)*S:H=H+Q(F)*S:T=T-(3*S)
1090GOTO890
1100VDU4:S=S*2:D=0
1110IFS=8THEN1120ELSESC=SC+T:T=5000:GOTO380
1120SC=SC+T
1130MODE7
1140*FX12,0
1150IFSC<=Z(9)THEN1270
1160B=9:*FX21,0
1170IFSC>Z(B)THENZ(B+1)=Z(B):S$(B+1)=S$(B)
1180IFSC<=Z(B-1)ORB=1THENZ(B)=SC:PRINT;A6$;"Well done
......you're in the top 9":PRINT;A2$;"Please enter you
r name":INPUT" ";S$(B)ELSE1200
1190IFLENS$(B)>12THENSOUND1,-15,100,5:CLS:GOTO1180ELS
EGOTO1210
1200B=B-1:IFB>0THEN1170
1210PRINT;A4$;"Press any key to play again":B=GET:RES
TORE760:SC=0:T=5000:CLS:GOTO310
1220*FX12,0
1230*FX21,0
1240MODE7
1250SOUND0,1,6,100:MODE7
1260GOTO1150
1270FORA=1TO2:PRINTCHR$(141);A6$;"NO HI-SCORE!":NEXT
1280*FX21,0
1290GOTO1210
```

Listing 2. Casino hex dump.

```
7530: 8E,D,89,10,8E,1E,4C,EC,A1,ED,
753A: 84,30,88,20,10,8C,1E,BE,25,F3,
7544: 8E,D,8C,10,8E,21,6C,EC,A1,ED,
754E: 84,30,88,20,10,8C,21,DE,25,F3,
7558: 8E,D,8F,10,8E,24,8C,EC,A1,ED,
7562: 84,30,88,20,10,8C,24,FE,25,F3,
756C: 8E,D,92,10,8E,27,AC,EC,A1,ED,
7576: 84,30,88,20,10,8C,28,1E,25,F3,
7580: 39,FC,7D,66,10,83,0,0,27,23,
758A: BE,1F,2E,BF,7D,64,8E,1F,2E,EC,
7594: 84,ED,2,30,1E,8C,1D,FE,26,F5,
759E: BE,7D,64,BF,1E,0,FC,7D,66,83,
75A8: 0,1,FD,7D,66,FC,7D,68,10,83,
75B2: 0,0,27,23,BE,22,4E,BF,7D,64,
75BC: 8E,22,4E,EC,84,ED,2,30,1E,8C,
75C6: 21,1E,26,F5,BE,7D,64,BF,21,20,
75D0: FC,7D,68,83,0,1,FD,7D,68,FC,
75DA: 7D,6A,10,83,0,0,27,23,BE,25,
75E4: 6E,BF,7D,64,8E,25,6E,EC,84,ED,
75EE: 2,30,1E,8C,24,3E,26,F5,BE,7D,
75F8: 64,BF,24,40,FC,7D,6A,83,0,1,
7602: FD,7D,6A,FC,7D,6C,10,83,0,0,
760C: 10,27,45,16,BE,28,8E,BF,7D,64,
7616: 8E,28,8E,EC,84,ED,2,30,1E,8C,
7620: 27,5E,26,F5,BE,7D,64,BF,27,60,
762A: FC,7D,6C,83,0,1,FD,7D,6C,BD,
7634: 75,30,7E,75,81,0,0,0,0,0,
763E: 0,0,A7,A0,5C,C1,10,26,F3,FC,
```

Casino

Smog,
Radcliffe-on-Trent,
Nottingham.



THIS IS A game that I devised while playing around with my assembler. I didn't realise how easy writing such a game was. The only thing involved is moving different memory locations around and testing others.

The hardest part was defining the graphics

(continued on next page)

(continued from previous page)

for the different reels. I did this using a short binary converter.

The game is a computerised version of the old one-arm bandit which is getting scarcer and scarcer in the local arcades..

The game can be played by up to four players and each player takes it in turns to try his luck with the reels of fortune. You win 90 pounds for two in a row, 500 for three in a row and 1,000 for a jackpot which is all four reels matched up — which I have never done! The program does not incorporate nudges or holds as the machine code will return to Basic after the last reel has stopped.

This can be changed with a little imagination from you and a fair knowledge of machine language. The line that would need changing is line 1690. You would then also need to add some Basic coding.

Type in listing 1 and save it, then enter listing 2 using a hex loader and save it as a machine-code file. Now enter the main program. When run listing 1 will load in the other two programs.

The game is fairly long and if you cannot be bothered to type it in I will send you a copy for £2.50 and a large SAE or jiffy bag: 12 Yonge Close, Radcliffe-on-Trent, Nottingham NG12 2EE.

Listing 1.

```
10 'c
20 ' a
30 '  s        TO RUN ON
40 '   i       A DRAGON 32.
50 '    n      THE MACHINE CODE
60 '     o     LIES ABOVE #7530.
70 '
80 'WRITTEN AND CREATED BY..
90 'DREW MARSHALL (C)1984
100 ' *SMOG* SOFTWARE LTD.
110 PCLEAR8:CLEAR2767,29999:ENTRY=30000:BYTE=0
120 GOSUB320 'INTRO
130 GOSUB230 'GRAPHICS  E.T.C.
140 GOSUB160
150 GOTO540
160 ENTRY=32700
170 FOR REEL =1 TO 4
180 FOR PICT =1 TO 8
190 READ OBJ:POKE ENTRY,OBJ
200 ENTRY = ENTRY+1
210 NEXT PICT,REEL
220 RETURN
230 IFENTRY<&H7530 THEN530
240 FOR PICTURE=1 TO 7
250 FOR BYTE =1 TO 16
260 READA$,B$:POKE ENTRY,VAL("&H"+A$):POKE ENTRY+1,VAL
("&H"+B$)
270 ENTRY=ENTRY+2
280 NEXT BYTE
290 NEXT PICTURE
300 PRINT@480," IMAGES HAVE BEEN POKED.....  ";:POKE1
535,96
310 RETURN
320 CLS0:PRINT@0,STRING$(32,179);CHR$(128);CHR$(128);S
TRING$(28,204);
330 FORI=1224 TO 1235:READA:PLAY"T25O1BFB-":POKEI,A:NE
XT:DATA3,128,1,128,19,128,9,128,14,128,15,46
340 A$=CHR$(128):PRINT@32*6+3,"written"A$"by"A$"drew"A
$"marshall";:PRINT@32*9,"   (C) SMOG SOFTWARE
  ";
350 PRINT@490,"please"A$"wait";
360 PLAY"T20O2CPBCCDEFGEFD-FGD-EAACF16AF16O3D-"
370 SCREEN0,1
380 RETURN
390 DATA0,0,7,E0,F,F0,1C,70,1C,70,38,30,30,30,30,0,FE,
0,FE,0,30,0,30,0,38,0,3F,F8,3F,F8,0,0   'pound sign
400 DATAC,10,14,28,2,40,1,80,7,E0,F,F8,1F,D8,3F,D8,3F,
EC,3F,CC,3F,D8,1F,F8,1F,F0,F,E0,7,80,0,0 'apple
410 DATAFF,FF,E1,87,F1,8F,B9,9D,9D,B9,8F,F1,87,E1,FF,F
F,FF,FF,87,E1,8F,F1,9D,B9,B9,9D,F1,8F,FF,FF,FF,FF
                'union jack
420 DATA0,0,0,0,3F,FC,3F,FC,3F,FC,0,1C,0,38,0,70,0,E0,
1,C0,3,80,7,0,E,0,1C,0,38,0,38,0        'number seven
430 DATA0,0,0,0,38,E,3C,E,3E,E,3F,E,38,8E,39,CE,38,EE,
38,7E,38,3E,38,1E,38,E,38,E,38,E,0,0    'nudge symbol
440 DATA70,7C,40,4,70,4,10,4,77,C4,5,44,5,40,0,0,0,F0,
0,90,20,F0,20,0,20,F,3F,8,0,A,0,E       smog symbol
450 DATAFF,FF,E0,7,C3,E3,8F,F1,9E,31,98,1,98,1,98,1,98
,1,98,1,9E,31,8F,F1,83,E1,C0,3,E0,7,FF,FF 'copyright s
ymbol
460 DATA5,3,6,2,7,1,4,6
470 DATA5,6,3,1,4,7,7,2
480 DATA5,1,4,6,7,3,2,6
490 DATA5,1,3,4,7,3,6,2
500 P=30192:FORI=1544TO1544+32*15STEP32:POKEI,PEEK(P):
POKEI+1,PEEK(P+1):P=P+2:NEXT
510 SCREEN1,0:SCREEN1,1:GOTO510
520 STOP
530 PRINT"error IN NUMERICS;":PRINT"COULD RESULT IN A
CRASH.":STOP
540 ENTRY =&H1E00:PRINT@480,"NOW FILLING DATA FOR EACH
 REEL ";:POKE1535,96:SCREEN0,1
550 RR=1
560 FOR P=32700 TO 32731
570 A=PEEK(P):IFA>8THENPRINT"\ERROR IN DATA/"
580 A=A-1
590 A=32*A:A=A+30000
600 FOR I=A TO A+31
610 POKE ENTRY ,PEEK(I)
620 ENTRY=ENTRY+1
630 NEXTI
640 FORI=1 TO6:POKEEN,0:EN=EN+1:NEXT
650 IF RR/8<>INT(RR/8)THEN670
660 IFRR<>32THENREAD ENTRY:IFEN<7680 OR EN >13000 GOTO
 530 ELSE SOUND1,1
670 RR=RR+1:NEXTP
680 DATA8480,9280,10080
690 PRINT@480,"FINISHED FILLING DATA.        ";:POKE1
535,96
700 FORI=1TO1000:NEXT
710 SOUND200,2
720 PRINT@480,"NOW LOADING MACHINE CODE.     ";:POKE1
536,96
730 SCREEN0,1
740 CLOADM
750 PRINT@480,"   LOADING MAIN PROG.         ";:POKE1
536,96:SCREEN0,1
760 CLOAD
```

Casino main program.

```
10 'MAIN PROGRAM FOR CASINO
20 GOSUB1240:GOSUB1070
30 RE=0:E=0:RD=0:DEFFNZ(Z)=256*PEEK(A)+PEEK(A+1)
40 E=5
50 RD =4079
60 RO=1
70 CLS0
80 FORO=1TO5:FORP=1TO12
90 PLAY"V20T050"+STR$(O)+";"+STR$(P):NEXTP,O
100 PRINT@42,"casino";
110 PRINT@480,"BY DREW MARSHALL              ";:POKE1
535,96
120 FORX=0TO63STEP2:FORY=10 TO 20 STEP 2
130 SET(X,Y,E):IFE=5 THENE=4ELSEE=5
140 NEXTY,X
150 IF RE=1 THEN RETURN
160 FORI=200 TO 1 STEP-5
170 SOUNDI,1:NEXT
180 E=4:RE=1:GOSUB120
190 FORP=1TO1000
200 NEXTP:CLS:SOUND200,2
210 PRINT"          :-CASINO-:"
220 PRINT
230 PRINT:PRINT
240 INPUT"HOW MANY PLAYERS (1-4) ";PL:IFPL<1 OR PL>4 T
HENCLS:GOTO210
250 FORI=1TOPL
260 PRINT"WHAT IS THE NAME OF PLAYER"I
270 LINEINPUTPL$(I)
280 IFLEN(PL$(I))>10 THEN260
290 NEXT
300 FORI=1TOPL:PM(I)=200:NEXT
310 'PRINTOUT
320 II=PL
330 CP=1
340 CLS0
350 IFPL$(CP)="**I**"THEN570ELSEPRINT"PLAYER"CP,PL$(CP
)
360 PRINT
370 PRINT"YOU HAVE"PM(CP)"POUNDS"
380 PRINT"DO YOU WISH TO PLAY THIS ROUND"
390 PRINT"(Y/N)"
400 IN$=INKEY$:IFIN$=""THEN400ELSEIFIN$="N"THEN570 ELS
E IFIN$<>"Y"THEN400
410 IFPM(CP)<=0 THEN 1370 ELSE PM(CP)=PM(CP)-40
411 IFSGN(PM(CP))=-1 THEN PM(CP)=0
420 PRINT"PRESS ENTER"
430 LINEINPUTA$
440 SCREEN1,1:PLAY"T100O5CODBAGHEDCEEDO6CDEFBDCCDE":EX
EC30000
450 IN$=INKEY$:IFIN$=""THENPLAY"V5T255O1E":GOTO450
460 POKE&H7D66,0:POKE&H7D67,19*RND(13)
470 POKE&H7D68,1:POKE&H7D69,10+(19*RND(12))
480 POKE&H7D6A,2:POKE&H7D6B,1+(19*RND(13))
490 POKE&H7D6C,3:POKE&H7D6D,11+(19*RND(12))
500 EXEC30081
510 A=4297:A(1)=FNZ(Z):A=4300:A(2)=FNZ(Z):A=4303:A(3)=
FNZ(Z):A=4306:A(4)=FNZ(Z)
520 GOSUB 760 'check for win
530 PM(CP)=PM(CP)+DW
540 FORP=1TO1000:NEXT
550 CLS0:PRINT@128,IFDW=90 THEN PRINT"TWO IN A ROW..CO
ULD HAVE DONE   BETTER" ELSE IF DW=500 THEN PRINT"THRE
E IN A ROW....NOT BAD!!!"ELSEIFDW=1000THENPRINT"WHAT M
ORE CAN I SAY??"ELSEPRINT"PATHETIC "PL$(CP)
560 FORP=1TO1500:NEXT
570 'NEXT PLAYER
580 CP=CP+1
590 IFCP>PL THEN 610
600 GOTO340
610 CLS
620 PRINT"WELL THAT IS THE END OF "
630 PRINT"ROUND "RO" THE MONEY."
640 PRINT"SITUATION IS LIKE SO..."
650 PRINT
660 FORI=1TOPL
670 PRINTPL$(I)" HAS "PM(I)" POUNDS"
680 PRINT:NEXT
690 PRINT"THERE ARE "7-RO"ROUNDS LEFT"
700 PRINT@480,"PRESS A KEY";:IFINKEY$=""THEN700
710 PRINT
720 RO=RO+1:IFRO<>7 THEN 310
730 PRINT"WELL I'M AFRAID THAT'S ALL I'VE GOT TIME FOR
...THE CASINO IS NOWCLOSED UNTIL YOU PRESS enter"
740 IFINKEY$<>CHR$(13)THEN740ELSEGOTO30
750 STOP
760 DW=0
770 IFA(1)=A(2) THEN DW=90 ELSE RETURN
780 IF A(2)=A(3)THENDW=500 ELSE RETURN
790 IF A(3)=A(4)THENDW=1000 ELSE RETURN
800 'JACKPOT!!!!!
810 FORO=1 TO 5
820 PLAY"O"+STR$(O)+"T30;V31;1;2;3;4;5;6;7;8;9;10;11;1
2;11;10;9;8;7;6"
830 NEXTO
840 FORI=1TO15:SCREEN1,1:SOUNDI*10,1:SCREEN1,0:SOUND25
5-I*10,1:NEXT
850 CLS:PRINT"Y",," O",," J"....,"    O",,"     O",,"
     T"....,"        T",,"          H",,"         E"
860 PRINT@420,"J  A  C  K  P  O  T";
870 PLAY"T40O1C"
880 FORP=1TO100:NEXTP
890 PRINT@420,STRING$(32,143);
900 FORP=1TO100:NEXTP
910 PLAY"T40O5B"
920 R=R+1:IFR<=6 THEN 860
930 FORI=1TO16:PRINT:SOUNDI*1.5,1:NEXT
940 CLS
950 PRINT"THAT WAS FANTASTIC!!"
960 PRINT"YOU RECIEVE 1000 POUNDS FOR THAT"
970 PRINT@480,"PRESS A KEY";
980 PRINT@492,CHR$(128);
990 FORP=1TO130:IFINKEY$=""THENNEXT ELSE 1030
1000 PRINT@492," ";
1010 FORP=1TO130:IFINKEY$=""THENNEXT ELSE 1030
1020 GOTO980
1030 PRINT@492,"...THANK YOU!!"
1040 FORI=1TO100:NEXT:RETURN
1050 GOTO1050
1060 GOTO1060
1070 PMODE4,1:PCLS5:COLOR0
1080 FORY=0 TO 170 STEP 20
1090 LINE(3,Y)-(13,Y+10),PSET:LINE-(3,Y+20),PSET:LINE(
252,Y)-(242,Y+10),PSET:LINE-(252,Y+20),PSET
1100 NEXT
1110 LINE-(255,191),PSET:LINE(3,170)-(0,191),PSET
1120 PAINT(3,10)
1130 PAINT(252,10)
1140 PMODE3:COLOR2
1150 LINE(30,30)-(225,160),PSET,BF
1160 PMODE4:COLOR0
1170 LINE(60,50)-(175,130),PSET,BF
1180 FORX=30TO225 STEP10:CIRCLE(X,5),5:CIRCLE(X,185),5
:PAINT(X,185):NEXT
1190 COLOR5:LINE(190,50)-(210,140),PSET,BF:COLOR0:LINE
(190,50)-(210,140),PSET,B
1200 DR$="NR5D5R5BM-5,5R5D6L5U3R5L5D3BM+0,+5NR5D3R5D5L
5BM+3,+5U18U2U3BM-3,+5ND5R5D5BM-5,+5D5R5U5L5"
1210 DRAW"BM196,60C0;XDR$;"
1220 PMODE3:DRAW"BM197,61C2;XDR$;":PMODE4
1230 RETURN
1240 CLS8:PRINT@33,"CASINO";
1250 PRINT@69,"INITIALISING";
1260 PRINT@107,"PLEASE";
1270 PRINT@133,"WAIT";
1280 PLAY"T5O01AABEDDE"
1290 SCREEN0,1:RETURN
1370 CLS
1380 PRINT"BECAUSE "PL$(CP)" IS OUT OF"
1390 PRINT"MONEY.WE MUST CLOSE THE CASINO  TO YOUR PAR
TY."
1395 PRINT"(IF I WERE YOU I WOULD NOT LET  HIM PLAY FO
R GETTING YOU CHUCKEDOUT OF THIS ACE PLACE.)"
1400 PRINT
1410 PRINT"TOTAL ROUND UP."
1420 PRINT"NAME","MONEY"
1430 FORI=1TOPL
1440 PRINTPL$(I),PM(I)
1450 NEXT
1460 PRINT@416,"TYPE clear TO RUN"
1470 IFINKEY$<>CHR$(12)THEN1470
1480 RUN
```

Light Cycles

Paul Burke, County Galway, Eire.



LIGHT CYCLES is a program for the Vic-20 based on the arcade game Tron. You must trap the three enemy cycles which are controlled by the computer. You move your cycle with the following keys; T– up , V– down , F– left , H– right.

To trap a cycle you must completely enclose it. No cycle may cross either its own or another's trail. You start off with three lives and every time you clear 10 screens you gain an extra one. You score 1,000 points every time you destroy three cycles plus a bonus depending on how quickly you clear the sheet.

The Vic-20 will wait for you to press a key before beginning each screen. When the game ends press shift to restart.

Because there is only 3.5K program space on the unexpanded Vic-20 I have split the program into two parts. Type in and Save program 1 now New the micro and type in and Save program 2. When loading just load program 1 and program 2 will automatically load and Run.

Program 1.

```
0 POKE36869,240
1 POKE52,27:POKE56,27:CLR:GOSUB300:POKE650,128
10 FORT=830TO860:READA:POKET,A:NEXT
11 K=RND(-W)
20 FORT=900TO940:READA:POKET,A:NEXT:REM UP
30 FORT=941TO981:READA:POKET,A:NEXT:REM RIGHT
40 FORT=982TO1022:READA:POKET,A:NEXT:REM DOWN
45 FORT=7600TO7640:READA:POKET,A:NEXT:REM DOWN
50 FORT=7424TO7538:READA:POKET,A:NEXT
60 FORT=7560TO7589:READA:POKET,A:NEXT
65 FORT=830TO1023:POKE6082+T,PEEK(T):NEXT
70 PRINT"[CLR]";:GOSUB600:PRINT"[RVS]LOADING PART TWO":LOAD
300 FORT=7168TO7255:READA:POKET,A:NEXT
310 FORT=7296TO7327:READA:POKET,A:NEXT
320 POKE36879,8:PRINT"[CLR]":POKE646,1:GOSUB600:PRINT"[RVS]    PLEASE WAIT"
330 FORT=1TO5:FORY=1TO6:POKE36879,16*Y:FORU=1TO100:NEXT:NEXT:NEXT:POKE36879,168
399 RETURN
400 DATA255,255,255,255,255,255,255,255
410 DATA28,62,119,99,65,119,54,28,28,54,119,65,99,119,62,28
420 DATA60,118,231,195,231,118,60,0,60,118,231,131,231,118,60,0
430 DATA0,84,42,84,42,84,42,0
```

(continued on page 183)

(continued from page 180)

```
440 DATA129,227,102,94,56,120,233,195,0,20,99,99,20,99,99,20
450 DATA20,99,99,20,99,99,20,0,100,100,146,129,146,100,100,0
460 DATA54,54,73,129,73,54,54,0
500 DATA255,128,128,128,128,128,128,128,255,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,255
510 DATA128,128,128,128,128,128,128,255
600 PRINT"[illegible]":PRINT"[illegible]":PRINT"[illegible]"
610 PRINT"[illegible]":PRINT"[illegible]":PRINT"[illegible]";
620 PRINT"[illegible]"
640 RETURN
1000 DATA169,0,133,0,165,0,201,5,208,3,76,1,0
1010 DATA165,254,201,1,208,3,76,132,3
1020 DATA201,2,208,3,76,173,3
1030 DATA201,3,208,3,76,214,3
1040 DATA76,176,29
2000 REM....UP........
2010 DATA160,0,177,252,201,15,16,9,169,2,133,254,230,0,76,66,3
2020 DATA169,7,145,252,160,22,169,5,145,252,165,252,24,233,21,133,252,165,253,23
3,0
2030 DATA133,253,96
3000 REM..RIGHT.......
3010 DATA160,23,177,252,201,15,16,9,169,3,133,254,230,0,76,66,3
3020 DATA169,9,145,252,160,22,169,5,145,252,165,252,24,105,1,133,252,165,253,105
,0
3030 DATA133,253,96
4000 REM...DOWN.......
4010 DATA160,44,177,252,201,15,16,9,169,4,133,254,230,0,76,66,3
4020 DATA169,6,145,252,160,22,169,5,145,252,165,252,24,105,22,133,252,165,253,10
5,0
4030 DATA133,253,96
5000 REM...LEFT.......
5010 DATA160,21,177,252,201,15,16,9,169,1,133,254,230,0,76,66,3
5020 DATA169,10,145,252,160,22,169,5,145,252,165,252,24,233,0,133,252,165,253,23
3,0
5030 DATA133,253,96
9000 DATA173,52,3,133,252,173,53,3,133,253,173,54,3,133,254,32,62,3,165,252,141,
52,3
9010 DATA165,253,141,53,3,165,254,141,54,3,165,0,141,58,3
9020 DATA173,55,3,133,252,173,56,3,133,253,173,57,3,133,254,32,62,3,165,252,141,
55,3
9030 DATA165,253,141,56,3,165,254,141,57,3,165,0,141,59,3
9040 DATA173,250,29,133,252,173,251,29,133,253,173,252,29,133,254
9041 DATA32,62,3,165,252,141,250,29
9050 DATA165,253,141,251,29,165,254,141,252,29,165,0,141,255,29,96
10000 DATA160,0,185,0,30,201,5,208,5,169,1,153,0,150,185,0,31,201,5,208,5
10010 DATA169,1,153,0,151,136,208,229,96
```

Program 2.

```
0 FORT=830TO1020:POKET,PEEK(6082+T):NEXT
5 POKE52,28:POKE56,28:CLR
10 POKE36869,255:PRINT"[illegible]":W=100:SC=0:LL=0:Q=0:POKE36878,10:X=7
15 K=RND(-W*50+9)
20 POKE1,96:POKE820,46:POKE821,30:POKE822,1
25 POKE823,1:POKE824,31:POKE825,3
30 POKE826,0:POKE827,0
35 POKE36879,56:P=7910:OA=22
40 POKE7674,255:POKE7675,30:POKE7676,1:POKE7679,0
45 I=0:I1=0:I2=0:CD=0:POKE36876,0:POKE36875,0:S=128
50 POKE252,0:POKE253,30:POKE254,4:PRINT"[illegible]";:A=0:FORT=1TO
10
55 PRINT"[illegible]QPQPQPQPQPQPQPQPQP[illegible]";
60 PRINT"[illegible]RSRSRSRSRSRSRSRSRS[illegible]";:NEXT:PRINT"[illegible]QPQPQPQPQPQPQPQPQP[illegible]";
65 PRINT"[illegible]";:POKE8185,0:POKE30720+8185,4
70 IFW=110THENW=100:Q=Q+10:LL=LL-1:X=X-1:IFX<1THENX=1
75 PRINT"[illegible]LEVEL"W-99"[illegible]SCORE"SC
80 POKE198,0:WAIT198,1:POKE198,0
85 PRINT"[illegible]PQPQPQPQ";:POKE198,0:WAIT198,1:TI$="
000000"
90 SYS7424:SYS7560:IFRND(1)>.8THENPOKE822,INT(RND(1)*4)+1
95 IFRND(1)>.9THENPOKE825,INT(RND(1)*4)+1
100 IFPEEK(7679)=5ANDI2=0THENGOSUB500:I2=1:CD=CD+1
105 IFPEEK(826)=5ANDI=0THENGOSUB500:I=1:CD=CD+1
110 IFPEEK(827)=5ANDI1=0THENGOSUB500:I1=1:CD=CD+1
112 Z1=Z1+1:IFZ1=XTHENSYS7424:SYS7560:Z1=0
115 IFCD=3THENCD=0:W=W+1:SC=SC+1000+1000-TI:GOTO15
120 F=PEEK(197):A=0:A=A+22*(F=50)-22*(F=27)-(F=43)+(F=42):IFA=0ORA=-OATHENA=OA
125 S=S+1.5:POKE36876,S:POKE36875,S:IFA<>OATHENS=128
127 POKEP,0:POKE30720+F,7:P=P+A:IFPEEK(P)<15THEN800
130 POKEP,1:POKEP+30720,2:OA=A:A=0
140 GOTO90
500 POKE36878,15:POKE36877,253:FORT=1TO150:NEXT:POKE36877,150:FORT=16TO0STEP-2
510 POKE36877,150:FORT=16TO0STEP-2:FORU=1TO40:NEXT:POKE36878,T:NEXT:POKE36877,0
520 POKE36878,10:RETURN
800 POKE36876,0:POKE36875,0:POKEP-A,6:LL=LL+1
805 POKE36878,170:FORT=0TO15:POKE30720+P-A,T:FORY=1TO40:NEXT
810 POKE36877,200-3*T:NEXT:POKE36877,0:IFLL=3THEN900
815 POKE198,0:WAIT198,1:GOTO15
900 POKEP-A,6:PRINT"[illegible]";:FORT=1TO9:PRINTMID$("GAME OVER[illegible]",T,1);:FORH=
1TO199
910 NEXT:NEXT:PRINT"[illegible]                    ":IFSC>HSTHENHS=SC
920 PRINT"[illegible]SC"SC,"HI"HS:WAIT653,1:GOTO10
```

Back-up Minefield

Anthony Timson,
Harrow-Weald,
Middlesex.



Both of the following programs were written on the 48K Oric-1 microcomputer but both will run on a 16K machine with some modification. Here is a brief description of each program.

Back-up: This short program will make a back-up of any piece of software — for personal use only. It consists of 39 bytes of machine code, and it is used by typing in !"Name" or !" ".

Once the program has loaded, the Oric will Ping and wait for you to press a key. During this time you should swap the leads etc. and set the tape recorder in record mode, then press any key and an exact copy of that program will be made.

An added bonus is that if the program is written in Basic then you can list it afterwards. Please note that this program copies only one stage of a program at a time, so for multi-stage programs — i.e., programs that load in more than one part, you must repeat the process several times, typing new before going on to the next stage.

The program is very small with no on-screen messages except for loading and saving, so that it allows nearly all of RAM to be available for programs. Because there are no absolute addresses, it can be relocated in memory.

Minefield: All the instructions are in the game.

Back-up.

```
 20 FOR X=#9000 TO #9027
 30 READ Y$:Y= VAL("#"+Y$)
 40 POKE X,Y
 50 NEXTX
 60 DATA A5,9C,A4,9D,85,00,84,01,08,20,25,E7,20,CA,E6,
20,A8,E4
 70 DATA 20,04,E8,20,85,FA,20,F8,C5,20,CA,E6,20,7B,E5,
20,04,E8,20,6B,C9,60
 80 DOKE #2F5,#9000
 90 HIMEM #9000
 100 CLS
 110 NEW
```

Minefield.

```
 1 REM FOR "_" READ POUND SIGN
 10 REM *************************
 20 REM * Minefield for the 48k *
 30 REM * Oric-1 Microcomputer. *
 40 REM *=======================*
 50 REM * (c)TIMMOSOFT 23/02/84 *
 60 REM *************************
 70 TEXT:GRAB:HIMEM #B399:DIMM1%(1000),M2%(1000)
 80 CLS:PAPER0:INK7:POKE#26A,10:PRINTCHR$(20)
 90 GOSUB 9000 'Define characters
 100 REM Main Loop
 110 REPEAT
 120 MINE%=10:SC%=0:LIVE%=3:FLAG%=0:CHEAT%=FALSE
 130 GOSUB 1000 'Title page
 140 GOSUB 2000 'Play the game
 150 UNTIL FALSE
 160 END
 1000 REM Title page
 1010 CLS:PAPER 0:INK7
 1020 PLOT 0,1,CHR$(20)+CHR$(7)+CHR$(10):PLOT0,2,CHR$(
20)+CHR$(7)+CHR$(10)
 1030 PLOT 14,1,"Minefield":PLOT 14,2,"Minefield"
 1040 FOR X=1 TO 5:PRINT:NEXTX
 1050 PRINT" In this game, invisible mines are "
 1060 PRINT"put around the screen. You (*) have to";
 1070 PRINT"get from the bottom of the screen to"
 1080 PRINT"the top of the screen, but if you hit"
 1090 PRINT"a mine, you lose a life. After every"
 1190 PRINT"full screen that you complete, the"
 1200 PRINT"number of mines is increased. To help"
 1210 PRINT"you on your travels, an indicator"
 1220 PRINT"shows you how many mines there are "
 1230 PRINT"in your vicinity."
 1240 PRINT" If you see a flag (_), you can coll-"
 1250 PRINT"ect it and get an extra 100 points. If";
 1260 PRINT"you hit the surrounding wall (#) you "
 1270 PRINT"die because it is also mined. After "
 1280 PRINT"time that you lose a life you will see";
 1290 PRINT"an action replay."
 1300 PRINT:PRINTCHR$(129)CHR$(140)"USE THE CURSOR KEY
S FOR MOVEMENT."
 1400 PLOT 0,25,CHR$(21)+CHR$(12)+"PRESS THE SPACE BAR
 TO PLAY ....."
 1410 REPEAT:GETA$:UNTIL A$=" "
 1420 CLS
 1430 PLOT6,12,CHR$(1)+"Do you wish to"+CHR$(12)+"Chea
t"+CHR$(8)+"?"
 1440 REPEAT:GET CH$:UNTIL CH$="y"OR CH$="n"
 1450 IF CH$="y"THEN CHEAT%=TRUE:GOSUB5000
 1460 RETURN
 2000 REM Play the game!
 2010 GOSUB 3000 'Set up screen
 2020 FOR X=1 TO 12:MUSIC1,5,X,10
 2030 PLAY 1,0,1,100:WAIT 7:NEXTX
 2040 PING:CNT%=1
 2050 REPEAT
 2060 K$=KEY$
 2070 IF K$<>""THEN PLOT X%,Y%," "
 2080 IF K$=CHR$(8) THEN X%=X%-1:SC%=SC%+5
 2090 IF K$=CHR$(9) THEN X%=X%+1:SC%=SC%+5
 2100 IF K$=CHR$(10) AND Y%<25 THEN Y%=Y%+1
 2110 IF K$=CHR$(11) THEN Y%=Y%-1:SC%=SC%+10
 2120 IF SCRN(X%,Y%)=35 OR SCRN(X%,Y%)=64 THEN EXPLODE
:DIE%=TRUE
 2125 IF SCRN(X%,Y%)=95 THEN SC%=SC%+100:ZAP
 2130 PLOT X%,Y%,"*"
 2140 IF K$<> "" THEN M1%(CNT%)=Y%:M2%(CNT%)=X%:CNT%=C
NT%+1
 2150 IF SCRN(X%-1,Y%)=64 THEN MN%=MN%+1
```

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NOTICE

Your Computer has been asked by Kensington CID to announce that they are currently investigating **Spirit Software.**

Readers who have responded to their advertisements will be contacted by the CID in the next 8 weeks.

MAKE MONEY WITH YOUR MICROCOMPUTER

Most people buy a micro *either* to play games, like 'Invaders', on it . . . *or* to learn more about computers . . . *or* as an educational aid for their children. But now, there is another — **potentially far more exciting** — way to use your microcomputer.

The fact is, *your micro can do the same amount of work it took several people many hours to do only a few years ago* . . . in a matter of minutes. What's more, most of your expenses are already covered — electricity, rent, rates and even the computer itself . . . they're all paid for. So **any money you bring in with your micro should be almost pure profit.** All you need now is the 'inside track' on who needs which services where, how to get them to sign on with you and what to charge.

New Guide Tells All

"**Make Money With Your Micro**" is a new, working manual that answers all these questions . . . and a lot more besides. Like **how to set up a small computer business** . . . what books to keep . . . when to call in professional help . . . how to arrange your workspace to maximum advantage . . . why *the right micro based business can be unusually profitable,* and what you need to climb on the bandwagon . . . before it really gets rolling. Here is a brief sampling of what else you can expect to learn from this special report:

What You Will Learn

- **Where to find customers** . . . and what to offer them.
- **Why word processing is different** . . . and some rather surprising, little-known, ways to make it pay big.
- **How to save businesses money** . . . and make yourself a small fortune in the process.
- **Which number services pay best** . . . and how to perform them efficiently.
- **Where to get referrals** . . . and why they matter.
- **Managing your time** . . . always important, but vital if you plan a part time operation.
- **Preparing mailing lists** . . . why this is potentially one of the most profitable services you'll be offering.
- **And much, much more.**

Where Do I Find Customers?

In addition to taking you through the very necessary steps that precede any truly successful microcomputer-based business, "**Make Money With Your Microcomputer**" **gives you the low-down on exactly which businesses want what services, and how best to get these firms as big paying customers.**

Working from this profession-by-profession section, **you can find several openings available right now to suit your circumstances** — areas where you, with your micro, can really *coin* money . . . giving people and businesses in your part of the country what they want and need to become more efficient . . . and, therefore, more profitable.

Do I Need Capital?

You don't require any 'capital' as such to get started in this microcomputer business . . . remember, what we are talking about here is primarily a service industry. You can work from home, in your own time at your own pace . . . starting with just a couple of evenings a week only, if you like. There's no need for 'staff' . . . *your micro does the hard work for you* . . . and your 'office' is already paid for because this, more than any other business in the world, takes very little space . . . almost any quiet corner will do.

Must I Be An Expert?

It really doesn't matter if you don't know a lot about computers, because there are plenty (almost too many!) 'ready-made' programmes already on the market . . . most of them with built-in instructions . . . covering just about every and any computer job you are likely to encounter in your new business. But, naturally, if you can design your own programmes, and that is what you enjoy, there's nothing to stop you doing so — although, frankly, the chances are there's a better, less expensive programme already in existence.

Which Micro Do I Need?

Almost any modern micro will do, because most programmes these days are — or can be made — compatible with just about any other microcomputer. If you haven't yet bought your own micro, you'll find the cost surprisingly low . . . and certainly very small compared to its earning potential. However, either way, you may need a few 'add-ons' . . . although, again, these cost very little when you consider how much money they can make for you.

An Alternative Service

If you prefer offering a service direct to the public, you'll also find in this new manual a special section devoted to areas where you can do just that. But, it's only fair to tell you now, you are likely to *make much more money helping companies* and the professions (e.g. Doctors, Architects, etc. etc.) than you ever could selling services direct to the public.

Get There First

As with any other business, to be successful you must find a need and fill it. Right now, there are literally dozens of companies and professions in your area that urgently need micro based help. The *big* money in this field will be made by those men and women, young or old, who are first to sign these businesses on as customers, and then grow with them.

Your Guarantee

"**Make Money With Your Microcomputer**", the practical, working manual that can guide you into this exciting new field, costs just £10, post paid. There is a 30 day satisfaction-or-your-money-back **guarantee**, so all you are risking to find out more about what could be the fastest growing part of our economy over the next few years is a few postage stamps.

How To Order

To order your copy now, just complete the form below and return it here. And, remember — the sooner you get it, the sooner you too can "make money with YOUR microcomputer!"

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To: Chartsearch Ltd., 11 Blomfield Street, London, EC2M 7AY.

Please send me one copy of "Make Money With Your Microcomputer" as soon as possible for which I enclose payment of £10 (includes postage and packaging)

☐ Cheque/Postal Order of £10 enclosed
☐ Please charge my Credit Card as follows:

A/C number__________ (Access/Visa/Diners/Amex)

From:
Name__________ BLOCK

Address__________ CAPITALS

__________ PLEASE

__________ Postcode__________

Signed__________ Date__________

(continued from page 183)

```
2160 IF SCRN(X%+1,Y%)=64 THEN MN%=MN%+1
2170 IF SCRN(X%,Y%+1)=64 THEN MN%=MN%+1
2180 IF SCRN(X%,Y%-1)=64 THEN MN%=MN%+1
2190 PLOT 7,0,STR$(MN%)
2200 MN%=0:PLOT 32,0,STR$(SC%)
2210 UNTIL DIE% OR Y%=2
2220 IF DIE% THEN 2270
2230 PING:CLS
2240 MINE%=MINE%+5:IF MINE%>25 THEN FLAG%=FLAG%+INT(R
ND(1)*5)
2260 GOTO 2000
2270 DIE%=FALSE:GOSUB7000
2280 LIVE%=LIVE%-1
2290 IF LIVE%=0 THEN GOSUB 8000:RETURN
2310 GOTO 2000
3000 REM Set up the screen
3010 PAPER4:CLS
3020 PLOT 0,2,"#######################################
"
3030 PLOTO,25,"#######################################
"
3040 FOR X=3 TO 25:PLOT 0,X,"#":PLOT 37,X,"#":NEXTX
3050 IF NOT CHEAT% THEN GOSUB 4000
3060 FOR X= 1 TO MINE%
3070 Y=INT(RND(1)*36)+1
3080 Z=INT(RND(1)*21)+3
3090 PLOT Y,Z,"@"
3100 NEXTX
3110 PLOT 0,0,CHR$(2)+"Mines:"
3120 PLOT 13,0,CHR$(3)+"Lives:"+RIGHT$(STR$(LIVE%),1)
3130 PLOT 25,0,CHR$(5)+"Score:"
3140 PLOT 18,2,"    "
3150 PLOT 18,25,"    "
3160 X%=19:Y%=25
3170 PLAYO,0,0,0
3180 IF FLAG%=FALSE THEN RETURN
3190 FOR X=1 TO FLAG%
3200 Y=INT(RND(1)*35)+1
3210 Z=INT(RND(1)*20)+4
3220 PLOT Y,Z,"_"
3230 NEXTX
3240 RETURN
4000 REM Redefine Mine
4010 FOR X=#B600 TO #B607
4020 POKE X,0
4030 NEXTX
4040 RETURN
5000 REM Redefine Mine
5010 POKE#B600,30
5020 POKE#B601,45
5030 POKE#B602,30
5040 POKE#B603,18
5050 POKE#B604,30
5060 POKE#B605,33
5070 POKE#B606,30
5080 POKE#B607,33
5090 RETURN
7000 REM Action Replay!
7010 GOSUB 5000 'Redefine Mine
7020 PLOT X%,Y%,"@"
7030 WAIT 75
7040 PLOTO,0,CHR$(17)+CHR$(12)+"ACTION REPLAY -- PLEA
SE WATCH"+CHR$(8)+CHR$(0)
7050 FOR X=1 TO CNT%-1:CALL#FB03
7060 PLOT M2%(X),M1%(X),"*"
7070 WAIT 15
7080 PLOT M2%(X),M1%(X)," "
7090 NEXTX:PLOT M2%(CNT%-1),M1%(CNT%-1),"X"
7100 ZAP
7110 WAIT 300
7120 RETURN
8000 REM Lost all lives
8010 FOR X=12 TO 1 STEP -1
8020 MUSIC 1,5,X,7:PLAY 1,0,7,100
8030 WAIT 20:NEXTX:PLAYO,0,0,0
8040 WAIT 500
8050 RETURN
9000 REM Define characters
9010 FOR X=#B6F8 TO #B6FF
9020 READ Y:POKE X,Y
9030 NEXTX
9040 DATA 16,28,30,28,16,16,16,56
9050 FOR X=#B550 TO #B557
9060 READ Y:POKE X,Y
9070 NEXTX
9080 DATA 12,18,12,63,63,51,18,18
9090 FOR X=#B518 TO #B51F
9100 READ Y:POKE X,Y
9110 NEXTX
9120 DATA 63,33,33,33,33,33,33,63
9130 RETURN
10000 REM THIS PROGRAM WAS WRITTEN BY
10010 REM Anthony Timson (c)1984 A.T.
```

Saturn Patrol

Patrick Edmond,
Driffield,
East Yorkshire.

CBM-64

SATURN PATROL IS a high-speed, arcade-style game for the Commodore 64. Use a joystick to control your ship at the top of the screen and fire down at the many swarming aliens, but watch out for the missiles aimed at your ship, even if you are moving they are fired on the correct trajectory — your skill is required to avoid them. There is no time limit to the game — just dodge the missiles as long as you can.

Saturn Patrol can be keyed in as shown but if you own an assembler or machine-code monitor and do not like waiting for the hex code to be entered from data statements into memory by the Basic routine — which takes about 45 seconds — then save the machine code separately.

Type in the program omitting lines 30, 1000 to 1460, 3000 to 3070 and add the following line

1 A = A + 1 : IF A = 1 THEN LOAD " ", 1, 1 and save on cassette

Now enter the hex code in lines 1000 to 1460 directly with your assembler starting at location $6000 (24576 decimal) and save this on cassette after the previous Basic program (Save $6000 to $62E0).

To load these programs press shift and run stop, the machine code will be loaded by line 1 of the Basic program.

Saturn Patrol uses three sprites — data stored from 16128 to 16384 — one for your ship, one for your bomb and one for the missile. User defined graphics start at 12288, Sys 25280 is a routine copying some of the Commodore 64 ROM characters into RAM for the words High Score and the numbers zero to nine.

The aliens make up characters 65 to 74, 65 being just the feet and consecutive characters are more of the alien up to 74 which is the whole alien.

One routine puts alien feet on the screen at random, another scars the screen and increments any character between 65 and 73 — hence the aliens build up from feet to whole body.

To change the colour of the aliens change line 352, the colour code is Poked into location 253 and the subroutine at 25184 fills colour RAM with this colour.

```
10 POKE52,48:POKE56,48:CLR
20 POKE46,44:POKE48,44:POKE50,44:CLR
30 GOSUB3000:REM ENTER MACHINE CODE
40 SYS25280:REM COPY ROM CHARSET
80 GOSUB2000:REM SET UP U.D.GRAPHICS
90 SP$="■■■■■■■■■■■■■■■■■■■■■■■■"
100 POKE53281,10:POKE53280,10:PRINT"J":POKE53272,21:POKE53269,0
110 PRINTSPC(14)"■SATURN PATROL"
120 PRINT"■■■DURING ROUTINE PATROL OVER THE SURFACE"
130 PRINT"OF SATURN YOU DISCOVER ALIENS GATHERING,"
140 PRINT"FOR AN INVASION ? ..... THESE ALIENS ARE"
150 PRINT"CERTAINLY HOSTILE , AT LEAST, SINCE THEY"
160 PRINT"IMMEDIATELY AIM  & FIRE MISSILES AT YOUR"
170 PRINT"ATMOS-CRAFT .... YOU DECIDE TO RADIO FOR"
180 PRINT"ASSISTANCE ,& IN THE MEANTIME ATTEMPT TO"
190 PRINT"CONTROL THESE SWARMING ALIENS."
200 PRINTSPC(7)"■■■PRESS ANY KEY TO CONTINUE":POKE198,0
210 GETA$:IFA$=""THEN210
220 PRINT"J":POKE53280,0:POKE53281,0
230 PRINT"■■USE A JOYSTICK (IN CONTROL PORT 2)"
240 PRINT"■■TO CONTROL YOUR ATMOS-CRAFT."
250 PRINT"■■■BEWARE OF THE MISSILES LAUNCHED AT HIGH"
260 PRINT"■SPEED....BONUS POINTS ARE AWARDED FOR "
270 PRINT"■■HITTING THEM IN MID-FLIGHT BUT SINCE "
280 PRINT"■■THEY ARE INDESTRUCTABLE YOU MUST SOCN"
290 PRINT"■■DODGE OUT OF THE WAY."
300 PRINTSPC(11)"■■■PRESS A KEY TO START":POKE198,0
```

```
340 GETA$:R%=RND(TI):IFA$=""THEN340
349 FORI=0TO16:POKE53248+I,0:NEXT
350 REM M/C ROUTINE TO COLOUR SCREEN
351 REM 251 STORES THE COLOUR CODE
352 PRINT"J":POKE253,6:SYS25184
353 FORI=0TO39:POKE1984+I,34
354 POKE1904+I,33:POKE56256+I,8
355 POKE56176+I,8:NEXT
356 REM SET SOUND + SPRITES
357 PRINTSP$;"HIGH SCORE";HI
358 FORI=0TO32:POKE32512+I,20:NEXT
359 POKE32565,0:POKE32566,0
360 POKE53288,1:POKE53289,1
361 FORI=0TO32:POKE32512+I,20:NEXT
362 POKE255,54:POKE254,0:POKE2040,255
363 POKE53248,54:POKE53249,50
364 POKE2041,254:POKE53264,0
365 POKE53269,1:POKE53287,7:POKE53276,1
366 POKE53285,8:POKE53286,10
367 POKE54272,5:POKE54277,63
368 POKE54278,9:POKE54276,0
369 POKE54296,15:POKE2042,253
370 POKE54274,0:POKE54275,1
371 POKE54286,200:POKE54287,0
372 POKE54291,10:POKE54292,10
373 POKE54290,0
374 POKE54274,0:POKE54275,1
375 POKE54281,10:POKE54280,10
376 POKE54284,15:POKE54285,7
377 POKE53272,28:POKE53278,0
378 POKE53271,0:POKE53277,0
379 PRINTSP$,TAB(24)"SCORE  000000"
400 SYS25238:REM MAIN GAME ROUTINE
401 R=PEEK(53248):R=R-10
402 IFR>=0THEN404
403 R=R+255:POKE53264,PEEK(53264)AND254
404 POKE53248,R
700 POKE2040,252:POKE53277,1
701 POKE53271,1:POKE54276,0
702 POKE54283,0:POKE54286,5
703 POKE54287,20:POKE54290,0
704 POKE54291,15:POKE54292,14
705 POKE54290,129:SC=0
706 FORJ=0TO50:POKE53249,50+(J*J/12.5)
707 POKE54287,3*J:POKE53287,2+J
708 IFJ=4THENPOKE54290,128
709 POKE53286,J:POKE53285,1+J:NEXTJ
710 FORI=0TO5
711 SC=SC+(PEEK(1980-I)-48)*10↑I
712 NEXT:PRINT"YOU SCORED ";SC
713 POKE53269,0:IFSC>HITHENHI=SC
714 PRINT"HIGH SCORE ";HI:POKE198,0
715 PRINT"PRESS ANY KEY"
716 GETA$:IFA$=""THEN716
717 GOTO100
900 DATA195,124,124,254,214,124,56,0
910 DATA32,32,0,60,240,0,51,48,0,51
920 DATA48,0,63,240,0,15,192,0,3,0,0
930 DATA1,0,0,-1
1000 DATAAD,00,DC,29,04,C9,04,F0
1005 DATA28,A5,FE,C9,00,D0,11,A5
1010 DATAFF,C9,1A,F0,1C,38,E9,02
1015 DATA85,FF,8D,00,D0,4C,31,60
1020 DATAA5,FF,38,E9,02,85,FF,8D
1025 DATA00,D0,B0,05,C6,FE,CE,10
1030 DATAD0,AD,00,DC,29,08,C9,08
1035 DATAF0,28,A5,FE,C9,00,F0,11
1040 DATAA5,FF,C9,40,F0,1C,18,69
1045 DATA02,85,FF,8D,00,D0,4C,62
1050 DATA60,A5,FF,18,69,02,85,FF
1055 DATA8D,00,D0,90,05,EE,10,D0
1060 DATAE6,FE,20,97,E0,A5,63,4A
1065 DATA4A,4A,AA,DE,00,7F,BD,00
1070 DATA7F,C9,00,D0,05,A9,13,9D
1075 DATA00,7F,A0,00,8C,31,7F,0A
1080 DATA0A,0A,8D,30,7F,0A,2E,31
1085 DATA7F,0A,2E,31,7F,18,6D,30
1090 DATA7F,8D,30,7F,90,03,EE,31
1095 DATA7F,A9,54,85,AA,A9,04,85
1100 DATAAB,AD,30,7F,18,65,AA,85
1105 DATAAA,90,02,E6,AB,18,AD,31
1110 DATA7F,65,AB,85,AB,8A,A8,A9
1115 DATA41,91,AA,8E,27,D0,8A,18
1120 DATA69,0A,8D,01,D4,29,01,18
1125 DATA69,12,8D,04,D4,EA,EA,EA
1130 DATAAD,03,D0,C9,00,D0,2E,A5
1135 DATA63,18,C9,F0,90,42,20,87
1140 DATA62,8D,02,D0,AD,10,D0,29
1145 DATA05,8D,10,D0,29,01,0A,0D
1150 DATA10,D0,8D,10,D0,A9,C8,8D
1155 DATA03,D0,AD,15,D0,09,02,8D
1160 DATA15,D0,4C,20,61,AD,03,D0
1165 DATA38,E9,08,8D,03,D0,18,C9
1170 DATA22,B0,0D,A9,00,8D,03,D0
1175 DATAAD,15,D0,29,05,8D,15,D0
1180 DATAAD,03,D0,38,E9,60,8D,08
1185 DATAD4,29,01,69,20,8D,0B,D4
1190 DATAA9,00,85,FB,AD,05,D0,C9
1195 DATA00,D0,44,AD,00,DC,29,10
1200 DATAC9,10,F0,38,AD,00,D0,8D
1205 DATA04,D0,4A,4A,4A,85,FC,A0
1210 DATA00,AD,10,D0,29,03,8D,10
1215 DATAD0,29,01,0A,0A,0D,10,D0
1220 DATA8D,10,D0,20,76,62,18,65
1225 DATAFC,18,69,26,85,FC,A9,04
1230 DATA85,FD,A9,30,8D,05,D0,B1
1235 DATAFC,8D,37,7F,4C,F6,61,A0
1240 DATA00,AD,37,7F,91,FC,A5,FC
1245 DATA18,69,28,85,FC,90,02,E6
1250 DATAFD,AD,05,D0,18,69,08,8D
1255 DATA05,D0,AD,15,D0,09,04,8D
1260 DATA15,D0,AD,05,D0,18,C9,D8
1265 DATA90,16,AD,15,D0,29,03,8D
1270 DATA15,D0,A9,00,8D,05,D0,8D
1275 DATA0F,D4,8D,12,D4,4C,F6,61
1280 DATAA0,00,B1,FC,8D,37,7F,18
1285 DATAC9,40,90,0A,18,C9,4B,B0
1290 DATA05,38,E9,40,85,FB,A9,20
1295 DATA8D,37,7F,A9,81,8D,12,D4
1300 DATAAD,05,D0,8D,0F,D4,AD,1E
1305 DATAD0,29,06,C9,06,D0,07,A9
1310 DATA64,18,65,FB,85,FB,EA,EA
1315 DATAEA,EA,EA,EA,EA,EA,EA,EA
1320 DATAA9,04,85,AB,A9,00,85,AA
1325 DATAA0,00,B1,AA,18,C9,40,90
1330 DATA0A,18,C9,49,B0,05,18,69
1335 DATA01,91,AA,C8,D0,EC,E6,AB
1340 DATAA5,AB,C9,08,D0,E2,A5,A9
1345 DATAEA,EA,C9,01,D0,14,AD,02
1350 DATAD0,38,E9,02,8D,02,D0,B0
1355 DATA08,AD,10,D0,29,05,8D,10
1360 DATAD0,60,AD,02,D0,18,65,A9
1365 DATA8D,02,D0,90,08,AD,10,D0
1370 DATA09,02,8D,10,D0,60,EA,EA
1375 DATAEA,EA,EA,EA,EA,EA,EA,EA
1380 DATAA2,00,A5,FD,9D,00,D8,9D
1385 DATA00,D9,9D,00,DA,9D,00,DB
1390 DATAE8,D0,F1,60,EA,EA,A0,20
1395 DATAAD,10,D0,29,01,C9,01,F0
1400 DATA02,A0,00,98,F0,00,60,AD
1405 DATA00,DC,4A,4A,49,03,29,03
1410 DATA85,A9,AD,00,D0,60,A5,FB
1415 DATAC9,00,F0,17,A2,06,C6,FB
1420 DATAFE,B6,07,BD,B6,07,C9,3A
1425 DATAD0,EC,A9,30,9D,B6,07,CA
1430 DATA4C,A0,62,20,00,60,AD,1E
1435 DATAD0,29,01,C9,01,D0,D7,60
1440 DATA78,A5,01,29,FB,85,01,A2
1445 DATA00,BD,00,D0,9D,00,30,BD
1450 DATA00,D1,9D,00,31,E8,D0,F1
1455 DATAA5,01,09,04,85,01,58,60
1460 DATA*
2000 FORI=0TO7:POKE12544+I,0
2001 POKE12992+I,24:NEXT
2002 FORI=0TO63:POKE12808+I,0:NEXT
2003 FORI=0TO7:READA:FORJ=0TO(7-I)
2004 POKE12879-J*8-I,A:NEXTJ,I
2005 FORI=16128TO16383:POKEI,0:NEXT
2006 FORI=0TO23:READA:POKE16320+I,A
2007 NEXT:FORI=24TO63:POKE16320+I,0
2008 NEXT
2009 FORI=0TO7:POKE16216+I*3,3
2010 POKE16280+I*3,3:NEXT
2011 FORI=1TO14:POKE12552+I,0:NEXT
2012 POKE12552,255:POKE12567,255
2013 FORI=16128TO16191:POKEI,RND(1)*255
2014 NEXT:RETURN
3000 READA:IFA<>-1THEN3000
3010 J=24576:PRINT"ENTERING DATA"
3020 READA$:IFA$="*"THENRESTORE:RETURN
3030 R$=RIGHT$(A$,1)
3040 L$=LEFT$(A$,1):L=ASC(L$)-48
3050 R=ASC(R$)-48:IFR>9THENR=R-7
3060 IFL>9THENL=L-7
3070 POKEJ,L*16+R:J=J+1:GOTO3020
```

```
   1 REM KEYWORDS    G.KENDALL
   5 IF PEEK 23631+256*PEEK 2363
2<>23734 THEN PRINT "STOP HERE."
: STOP
  10 CLEAR 30999
  20 LET ADD=31000: REM address
  30 LET H=0: REM   hex to dec
  40 LET NUM=1010: REM line no.
  50 LET ERR=0: REM error count
  60 PRINT "PLEASE WAIT..."
 100 RESTORE : READ A$,A
 110 FOR F=1 TO 301
 120 FOR Z=1 TO 2
 140 LET H=H*16+CODE A$(Z)-48-7*
(A$(Z)>"9")
 150 NEXT Z
 160 LET ERR=ERR+H
 170 POKE ADD,H: LET ADD=ADD+1:
LET H=0
 180 LET A$=A$(3 TO )
 190 IF NOT LEN A$ THEN GO SUB 5
00
 200 NEXT F
 210 PRINT NUM'"O.K."
 220 SAVE "BASIC": GO TO 220
 290 STOP
 500 IF ERR<>A THEN PRINT "ERROR
 IN LINE ";NUM: STOP
 510 PRINT NUM: READ A$,A: LET N
UM=NUM+10
 520 RETURN
1000:
1010 DATA "2A535C2B01EB00CD5A160
111002A4F5C11D05C232373237209EB"
,1939
1015:
1020 DATA "21315B010600EDB021150
022105CFDCB30DEC9F409A8104B80",4
295
1025:
1030 DATA "213B5CCB5E2016CBDE3EF
D32415CCDA81028FBF5CD1D11AFCD011
6F1C9CDA810F5FE0DCC125D",9014
1035:
1040 DATA "CDFB5CF1C93AB85CFE0DC
011085DCD1311C93A0D5C11D05CCD131
1C92A595C2B237EFE0DC8FE222073FE"
,13870
1045:
1050 DATA "0E287AFE4038EFFE5B30E
B22B05C16A30194002AB05C030AFE36C
AA45DCB7F28031418F2BE20EF0B0A03"
,18157
1055:
1060 DATA "1730E91E0103231C0ABE2
8F9CB7F20030B18D614E67FBE20D0237
EFE202812FE0D20C6233EB0BE2B208F"
,22151
1065:
1070 DATA "E5D5CD5216D1E11C06004
DA7ED427EFE202802230D72E523CDE81
9E11884237EFE2228F8FEB0CB18F523"
,27261
1075:
1080 DATA "2323232318ECE5ED5B615
CA7ED52E1D018E021187911045B01330
0EDB0CD045B214B7911D05C01E000EDB
0C900",32014
```

Keyword

Glyn Kendall,
Streatham,
London SW16.



HAVING RECENTLY obtained a proper keyboard for the Spectrum that did not have the legends printed on the keys, and disliking the idea of painting them on, I set about writing a routine to enable the keywords to be typed in letter by letter. This may seem a retrograde step but using the multi-shifted Spectrum I find myself chanting things like Symbol Shift Caps Symbol Shift x to get Ink up on the screen.

The routine is not interrupt driven so will not tie up computing time, in fact it comes into operation between the time you press enter and the ROM's syntax checker gets at it. The working section consits of 223 bytes so you only lose about 230 bytes from Basic..

Enter the program and Run it, the checks will catch most of the errors and print what line they occurred in. When correct the Program will go into a loop and save itself in case of any undetected errors. When you are satisfied that you have saved enough copies break into the program and New it. Then enter.

RAND USR 31274

(continued on page 189)

(continued from page 187)

This will put the code in the right place and turn it on. Press Enter and you should have a different cursor. If not or the program crashes then Load Basic again and carefully check it against the listing. If it is OK then Enter the header. This must be entered as listed — except for the colour statements — or the computer will crash.

SAVE "KEYWORD" LINE 1 :SAVE "START" CODE 23300,51 : SAVE "MAIN" CODE 23760,224

This will be the working copy so save it a few times. You can now delete the header.

Start is put in the printer buffer because it is only needed once, so you can wipe it out if you want. Do not call Start more than once as it reserves memory for Main each time it is used. To turn it off

POKE 23736,168: POKE 23737,16

To turn it back on

POKE 23736,208; POKE 23737,92

It is safer if you put these commands on a single line separated by a colon. In fact I insist that you do. Note that the address of a line 1 Rem is no longer 23760.

Using keyword; the editor will search for keywords in capitals followed by a space or in certain circumstances non capitals i.e., numeric. If in doubt put a space. Single words like Run or List can be entered direct — no space. E mode and Graphics mode are recognised as is Symbol Shift Caps etc. The only thing missing is the K mode. Anything in quotes is ignored but a Rem line is not. This should not matter as the computer will jump it anyway. Do not forget that words like Goto and Gosub need spaces in them to be recognised.

Point plot

I S Gibson, Maidstone, Kent.



THIS PROGRAM enables points to be plotted and lines to be drawn in Mode 6 and Mode 3. This means that including the program, there is 3K more than Mode 0 in Mode 3 and 1K more in Mode 6 than Mode 4. Points may be plotted using the form:

PROCPLOT (X,Y)

and unplotted using

PROCUNPLOT (X,Y)

Also I've added a line drawing routine

PROCLINE (X1,Y1,X2,Y2;P)

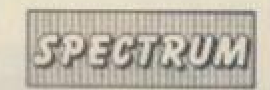
where P is 1 for a plotted line and 0 for unplotted. The variable ST% must be 640 in Mode 3 or 320 in Mode 6.

If the screen is wobbly, change the 38 in line 70. Values between 30 and 45 are best.

```
   10REM MODE 6 & MODE 3 PLOTTER
   20REM by I.Gibson
   30MODE 3
   40ST%=640: REM ST%=320 for MODE 6
   50VDU 23;8202;0;0;0;
   60VDU 23,0,9,7,0;0;0;
   70VDU 23,0,4,38,0;0;0;
   80VDU 23,0,7,30,0;0;0;
   90VDU 23,140,128,128,128,128,128,128,128,1
28
  100PRINTTAB(0,11);"________________________
______________________________________________
_______________"
  110FOR D%=0 TO 24
  120PRINTTAB(40,D%);CHR$(140);
  130NEXT D%
  140PROCLINE(320,104,328,104,1)
  150FOR X5%=0 TO 639
  160PROCPLOT(X5%,90*SIN(X5%/102)+104)
  170NEXT
  180END
10000DEF PROCLINE(XX1%,YY1%,XX2%,YY2%,SE"%)
10010OO%=XX2%-XX1%:WW%=YY2%-YY1%:ZZ%=SGN(OO%)
:VV%=SGN(WW%):RR%=SGN(OO%):SS%=0:NN%=ABS(OO%)
:MM%=ABS(WW%)
10020IF NN%>MM% THEN 10040
10030RR%=0:SS%=SGN(WW%):NN%=ABS(WW%):MM%=ABS(
OO%)
10040JJ%=INT(NN%/2)
10050FOR KK%=0 TO NN%
10060IF SET%=1 THEN PROCPLOT(XX1%,YY1%) ELSE
PROCUNPLOT(XX1%,YY1%)
10070JJ%=JJ%+MM%
10080IF JJ%<NN% THEN 10110
10090JJ%=JJ%-NN%:XX1%=XX1%+ZZ%:YY1%=YY1%+VV%
10100GOTO 10120
10110XX1%=XX1%+RR%:YY1%=YY1%+SS%
10120NEXT KK%
10130ENDPROC
10140DEF PROCPLOT(X%,Y%)
10150Y%=199-Y%
10160P%=((X% DIV 8)*8+(Y% MOD 8)) + (Y% DIV 8
)*ST%
10170A$="00000000"
10180M%=X% MOD 8
10190A$=LEFT$(A$,M%)+"1"+MID$(A$,M%+2)
10200?(HIMEM+P%)=?(HIMEM+P%) OR FNBIT(VAL(A$)
)
10210ENDPROC
10220DEF PROCUNPLOT(X%,Y%)
10230Y%=199-Y%
10240P%=((X% DIV 8)*8+(Y% MOD 8) + (Y% DIV 8)
*ST%)
10250A$=""
10260TI%=?(HIMEM+P%)
10270EN%=256
10280FOR TR%=1 TO 8
10290EN%=EN%/2
10300IF TI%>=EN% THEN TI%=TI%-EN%:A$=A$+"1" E
LSE A$=A$+"0"
10310NEXT TR%
10320M%=X% MOD 8
10330A$=LEFT$(A$,M%)+"0"+MID$(A$,M%+2)
10340?(HIMEM+P%)=FNBIT(VAL(A$))
10350ENDPROC
10360DEF FNBIT(B%)
10370IF B% MOD 10>1 THEN =0
10380IF B%=B% MOD 2 THEN =B% ELSE = FNBIT(B%
DIV 10)*2+B% MOD 2
```

Break-disable

Robert Newman, Peterborough, Northamptonshire.



I HAVE WRITTEN two machine-code routines for the Spectrum which disables the Break key during the running of a Basic program — i.e., preventing the errors "Break into program" and "Break — Cont repeats" from halting the program.

Routine A also causes the computer to reset when the program finishes, or if any error apart from Break occurs. This would be useful if you want to prevent people from listing or copying your program. However, unless your program is on a Microdrive, it could always be Merged instead of Loaded to overcome this.

Routine B just disables Break, so that if the program stops for any other reason it can be listed, edited, Run etc.

Put the lines of Basic from listing 1 at the beginning of your program, using the Data statements for either routine A or routine B. Both routines can be used with 16K or 48K. You only need to change the Clear statement in line 2, and the value of Start in line 3.

If you only want to disable break during certain parts of your program, then miss out lines 5 and 6, and use the two Pokes later when you want to switch break-disable on. Break can then be re-enabled with these two Pokes:

POKE errsp,3 : POKE errsp + 1,19

Listing 1.

```
 1 REM Break-disable (C) R Newman 1984
 2 CLEAR 65329           : REM or 32559 if 16K
 3 LET start = 65330     : REM or 32560 if 16K
 4 LET errsp = PEEK 23613 + 256 * PEEK 23614
 5 POKE errsp, start - 256 * INT (start/256)
 6 POKE errsp+1, INT (start/256)
 7 READ n
 8 FOR j = start TO start + n - 1
 9 READ a : POKE j,a
10 NEXT j
Use these DATA statements for routine A :-
11 DATA 27,33,start-256*INT(start/256),INT(start/256),229,58,58,
      92,254,20,40,5,254
12 DATA 12,194,0,0,253,54,0,255,253,203,1,174,195,125,27
Use these DATA statements for routine B :-
11 DATA 33,33,3,19,58,58,92,254,20,40,4,254,12,32,15,33
12 DATA start-256*INT(start/256),INT(start/256)
13 DATA 229,253,54,0,255,253,203,1,174,195,125,27,229,195,3,19
```

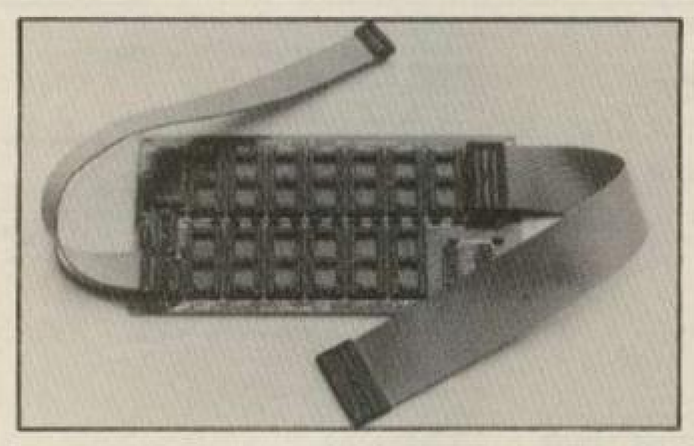
Demo program for routine A.

```
 10 REM Break disable demo
 20 REM Robert Newman 1984
 30 REM Routine A
 40 CLEAR 65329
 50 LET start=65330
 60 LET errsp=PEEK 23613+256*PEEK 23614
 70 POKE errsp,start-256*INT (start/256)
 80 POKE errsp+1,INT (start/256)
 90 READ n
100 FOR j=start TO start+n-1
110 READ a: POKE j,a
120 NEXT j
130 DATA 27,33,start-256*INT (start/256),INT (start/256),229,58,58,92,254,20,40
,5,254
140 DATA 12,194,0,0,253,54,0,255,253,203,1,174,195,125,27
145 REM ************************
146 CLS
150 PRINT "Demonstration of routine A."
160 PRINT "This routine disables BREAK."
170 PRINT "If any other error occurs, or   the program finishes, the        comp
uter will reset itself."
180 PRINT "This prevents the program from  being listed or copied."
190 PRINT '"Try pressing BREAK."
200 FOR j=1 TO 400
210 PRINT AT 10,10;j
220 NEXT j
230 CLS
240 PRINT "Pressing BREAK,N or space does  not prevent scrolling."
250 FOR j=1 TO 50: PRINT j: NEXT j
260 PRINT "To return to start of demo,enterY. Other inputs will cause reset"
270 INPUT a$
280 IF a$="Y" OR a$="y" THEN  GO TO 145
```

Demo program for routine B.

```
 10 REM Break disable demo
 20 REM Robert Newman 1984
 30 REM Routine B
 40 CLEAR 65329
 50 LET start=65330
 60 LET errsp=PEEK 23613+256*PEEK 23614
 70 POKE errsp,start-256*INT (start/256)
 80 POKE errsp+1,INT (start/256)
 90 READ n
100 FOR j=start TO start+n-1
110 READ a: POKE j,a
120 NEXT j
130 DATA 33,33,3,19,58,58,92,254,20,40,4,254,12,32,15,33
135 DATA start-256*INT (start/256),INT (start/256)
140 DATA 229,253,54,0,255,253,203,1,174,195,125,27,229,195,3,19
145 REM ************************
146 CLS
150 PRINT "Demonstration of routine B."
160 PRINT "This routine disables BREAK."
170 PRINT "Successful completion, or any   error except BREAK will stop theprog
ram, which can then be      listed and RUN again."
190 PRINT '"Try pressing BREAK."
200 FOR j=1 TO 500
210 PRINT AT 10,10;j
220 NEXT j
230 CLS
240 PRINT "Pressing BREAK,N or space does  not prevent scrolling."
250 FOR j=1 TO 50: PRINT j: NEXT j
260 PRINT "To return to start of demo,enterY. Other inputs will end program"
270 INPUT a$
280 IF a$="Y" OR a$="y" THEN  GO TO 145
```

ROM extension board for the BBC Micro



Personal Computer News January '84
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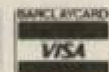
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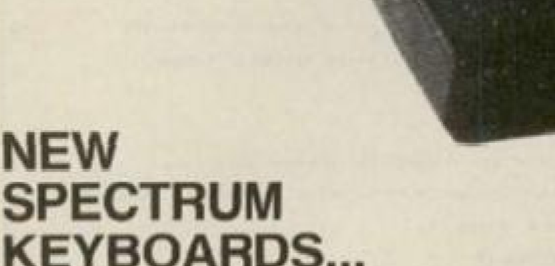
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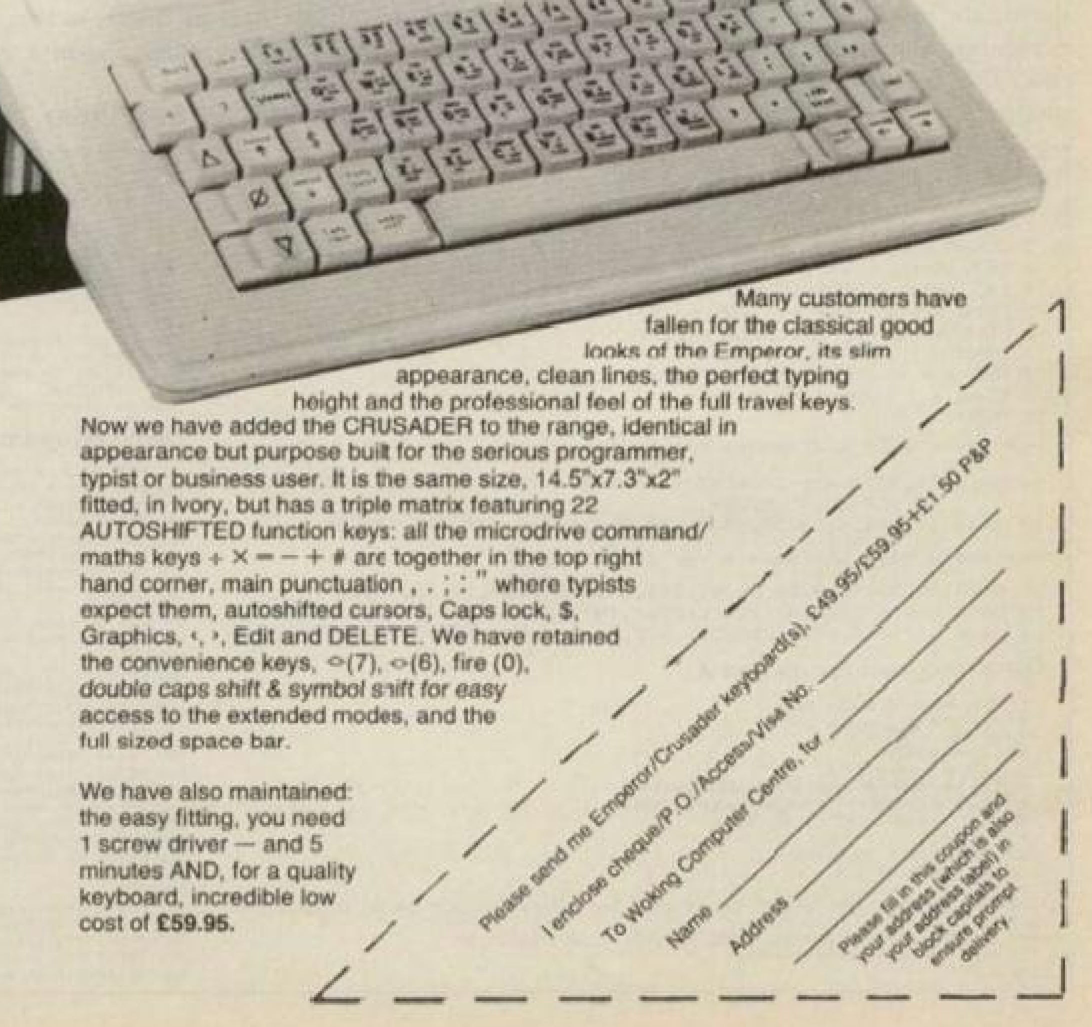
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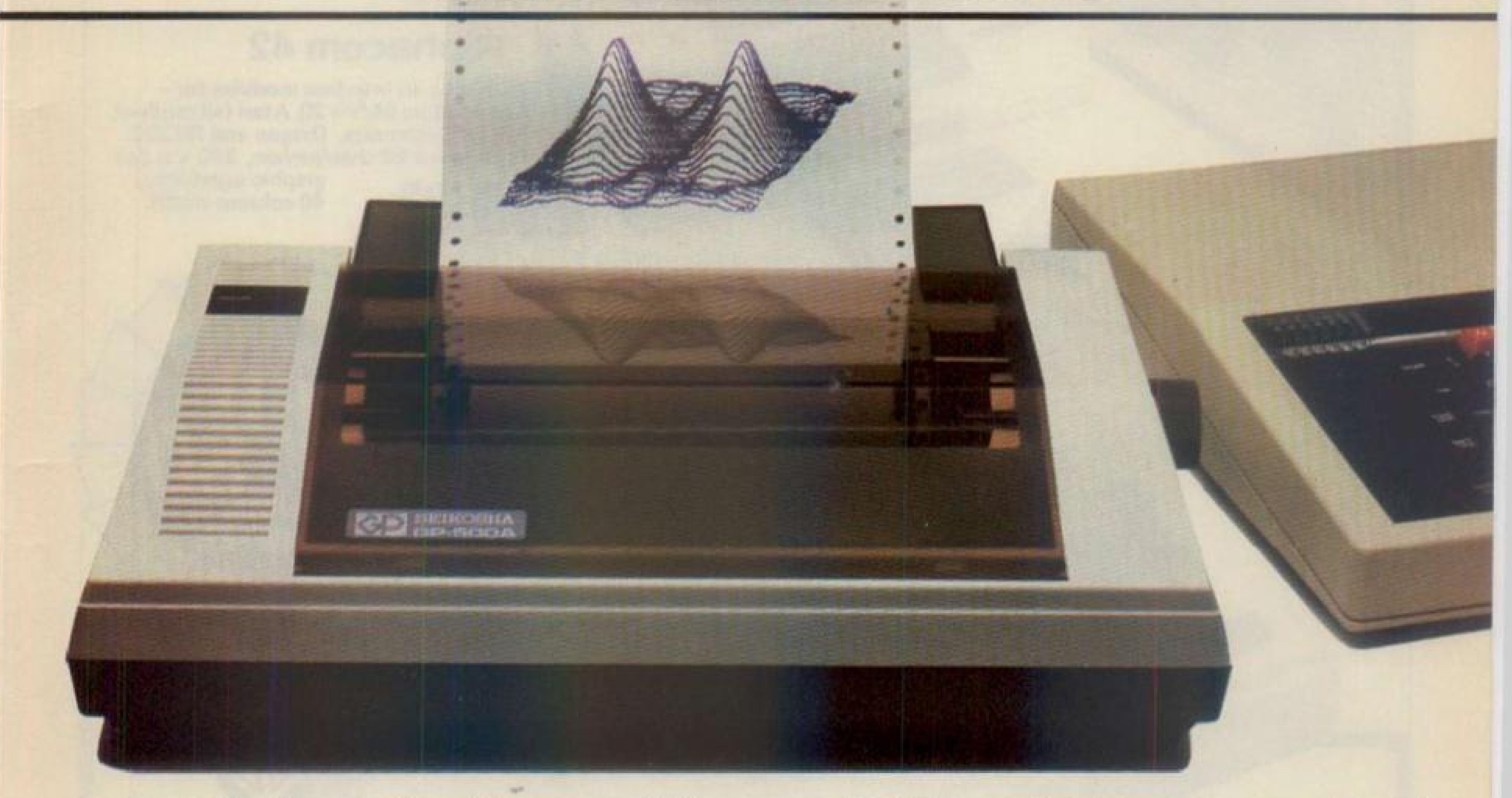
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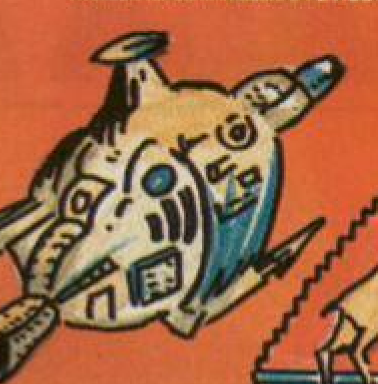
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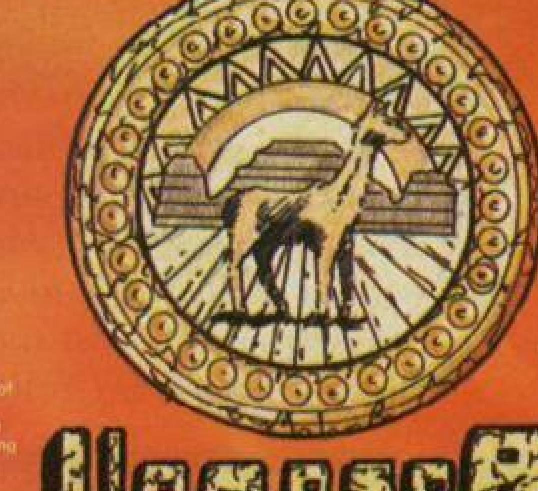


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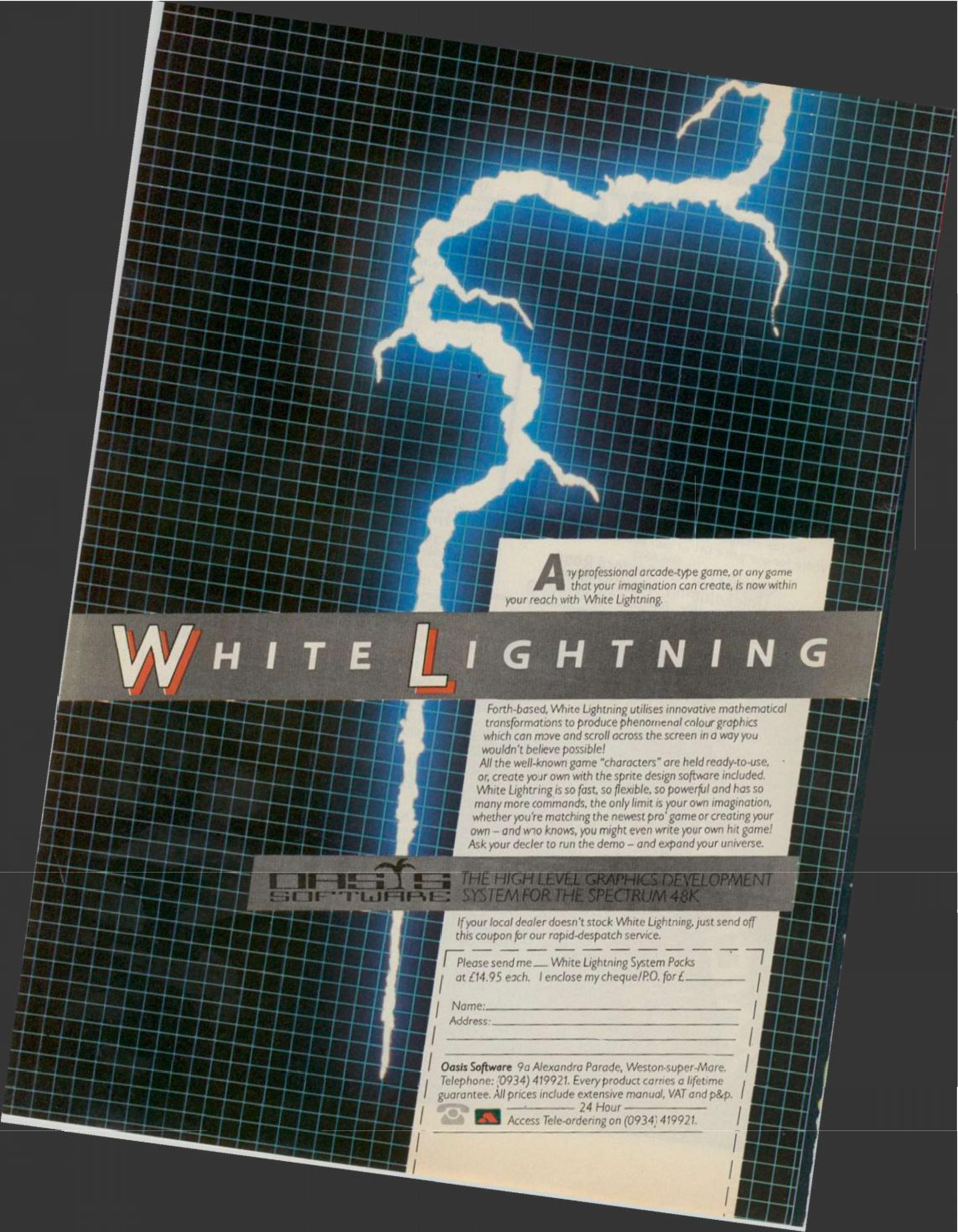


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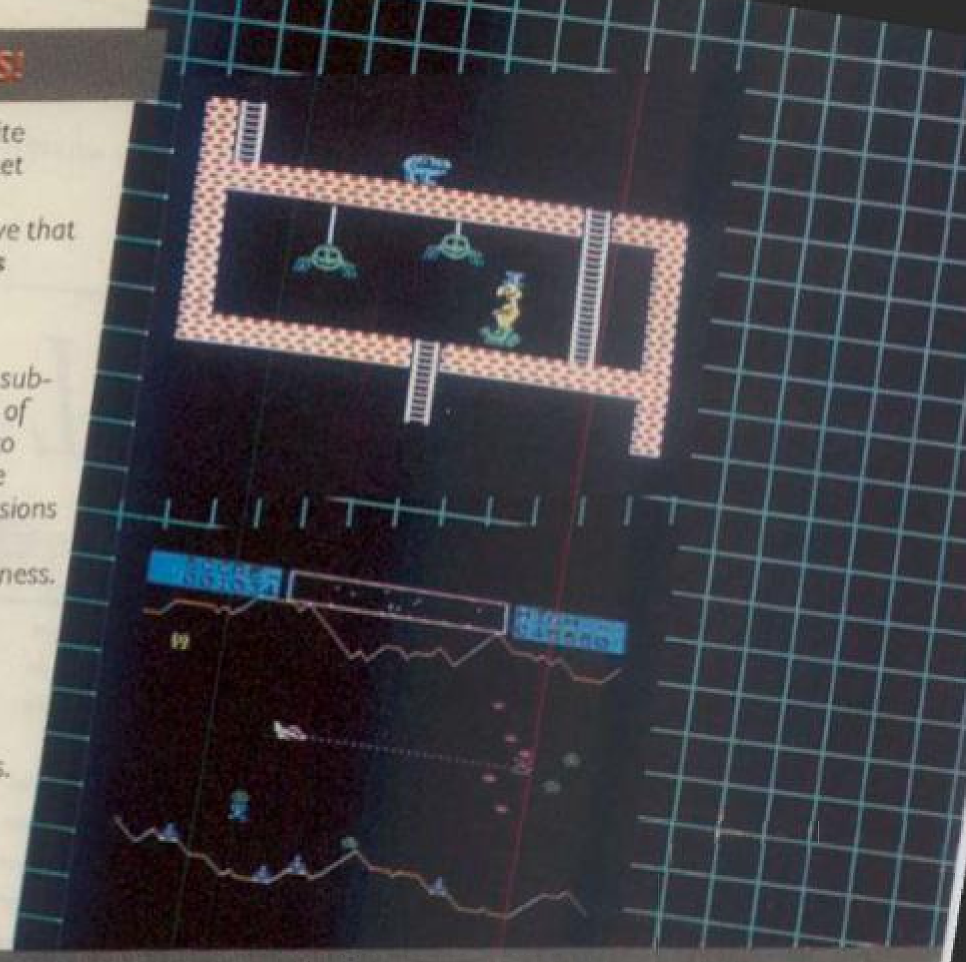


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THE KEY TO PROFESSIONAL GAMES DESIGN

program smoothly scrolls the landscape, the second animates the other characters. This is undoubtedly one of White Lightning's most powerful features.

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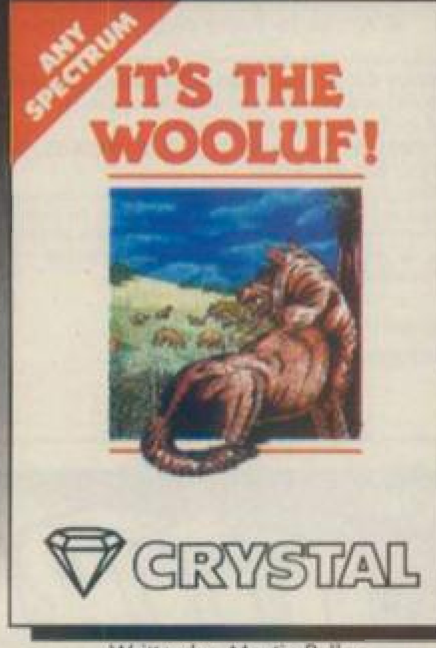


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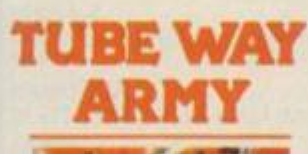
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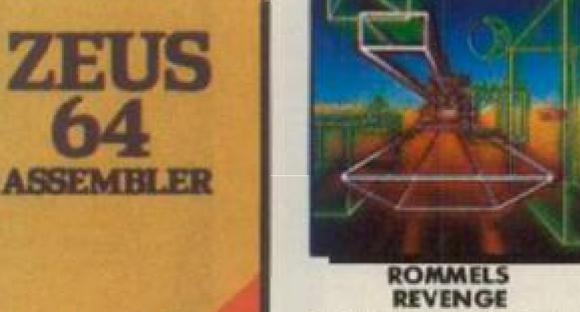


HALLS OF THE THINGS
Written by: Neil Mottershead, Simon Brattel and Martin Horsley



INVASION OF THE BODY SNATCHAS
Written by: Simon Brattel and Neil Mottershead

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Written by: Graham Stafford



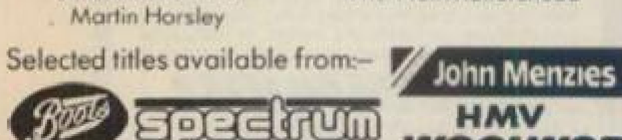
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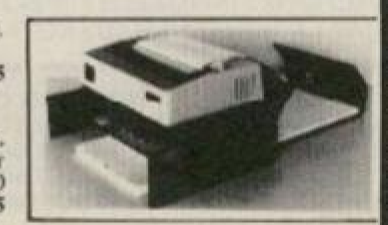
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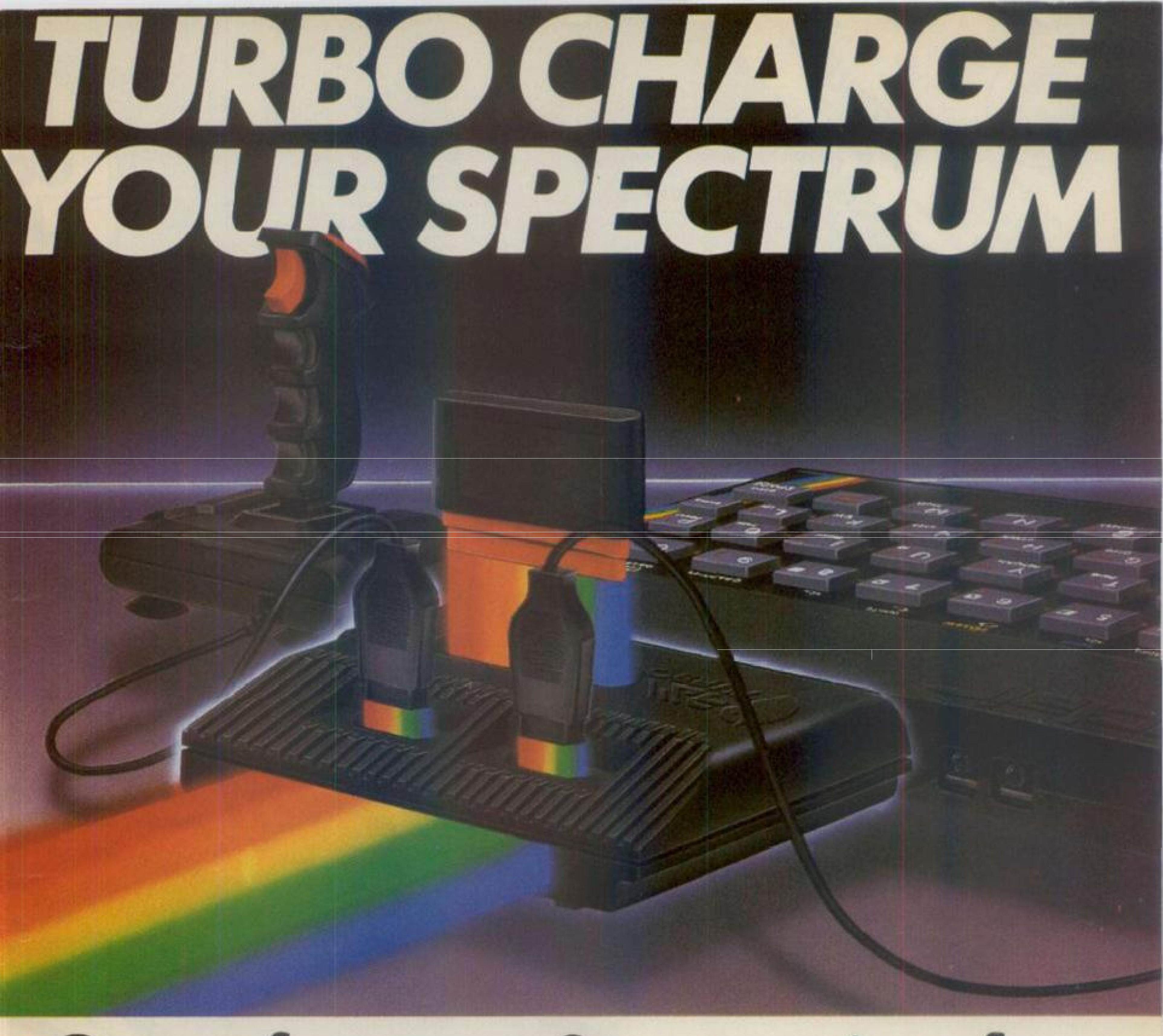
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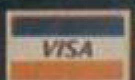
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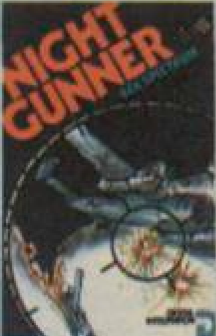
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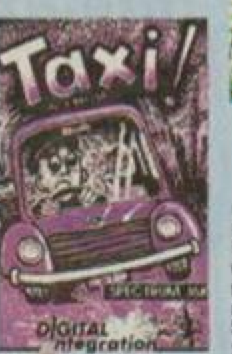


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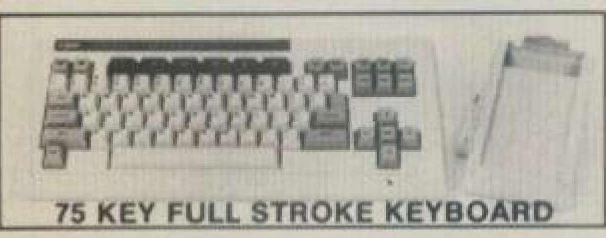


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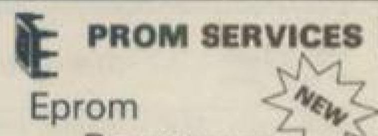
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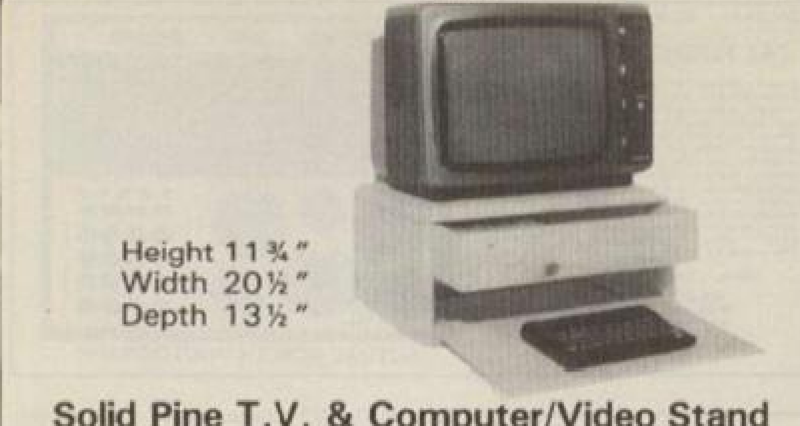
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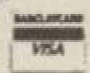
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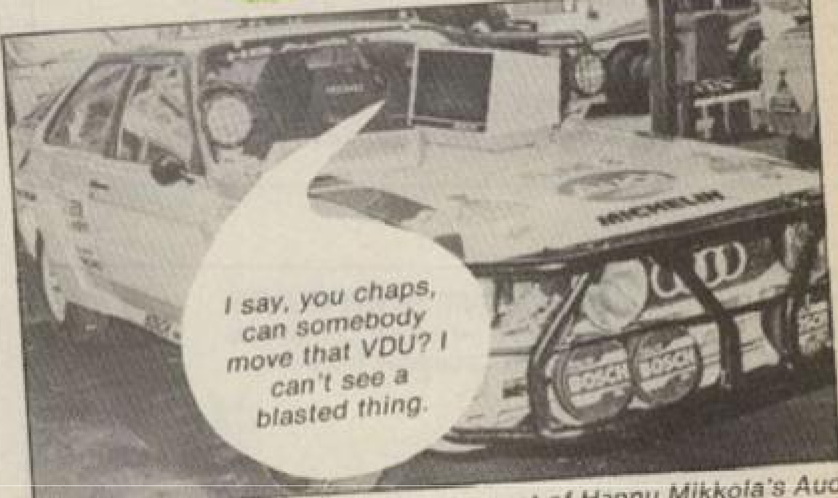
Local, national and international micro events are updated here. To publicise your event, phone Paul Bond on 01-661 3472.

Computer Fair

From June 14-17 at Earl's Court, sponsored by *Practical Computing* and *Your Computer* — this is the place to be seen if you have a microcomputer. Telephone Reed Exhibitions on 01-643 8040 for more information.

International Commodore Computer Show

From June 7-9 at The Novotel in Hammersmith. Commodore hardware and software. Contact Novotel in London for more details.



A Memory 7500 computer on the bonnet of Hannu Mikkola's Audi Quattro. Used in the Nairobi Safari Rally to process data — hopefully not on the bonnet of a car. This is very bad practice ergonomically, especially if you are sitting in the driver's seat.

Educational Software Fair

On 18 and 19 June there will be an Educational Computing and Software Fair at John Taylor Teachers' Centre, Headingley Lane, Leeds. Teachers and all interested in education — in an ideal world, this would include pupils too, I guess — are welcome and it's free. Contact Mr G Creighton, Computer Development Team, at the above address. Telephone 0532-782181.

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